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Army Aeromedical Crash Rates

Restructuring the Medical Service Corps: The 70Z Proposal

Acute Myocardial Infarction

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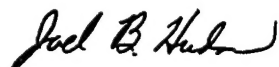
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Perspective

Individuals

Individuals can, and do, make a difference. We see that every day, but it struck me again as I reviewed this volume of the Journal which has several articles focusing on medical evacuation. Not too long ago we dedicated the plaza adjacent to the AMEDD Center and School to DUSTOFF soldiers and in the process we, in conjunction with the DUSTOFF Association, honored MG Spurgeon Neel. Major General Neel is universally considered the father of "DUSTOFF." When he was a young surgeon with the 82d Airborne Division, he participated in concept development for using helicopters in medical evacuation. Later, at what is now the AMEDD Center and School, he developed the doctrine, tactics, technique and procedures, and participated in forming up and training of the first helicopter medical evacuation units. He was subsequently assigned to Korea where, as a Commander, he executed the doctrine he wrote. But he did not stop there as an operator. He recorded his observations and continued to write articles refining his thoughts and sharing his ideas with others on the use of the helicopter in medical evacuation operations. Later, as a General Officer and Commander of the 44th Medical Brigade in Vietnam, MG Neel again brought the use of helicopters in medical evacuation into a new level and now with the call sign universally recognized by all today as "DUSTOFF."

Individuals do make a difference! This Journal offers the chance for you to share your ideas and excellent work with your professional community. I thank those of you who have contributed to this issue of the Journal and encourage you to continue these contributions.

Several articles in this issue focus on MEDEVAC and reflect its importance in the overall AMEDD mission. Others cover the spectrum of technical expertise in our AMEDD.

- *Maximizing Medical Evacuation.* Provides an operational perspective on forward support MEDEVAC teams in the theater of operation. The author draws on valuable lessons from the Combat Maneuver Training Center at Hohenfels, Germany.

- *Army Aeromedical Crash Rates.* A retrospective study

of helicopter crash rates in the U.S. Army. The findings support the continued commendable safety record of both Army general and MEDEVAC-specific aviation.

This impressive safety record can serve as a model for all personnel in the AMEDD.

- *Disease and Nonbattle Injury Forecasting.* Describes a quantitative model for predicting casualties during operational deployments. Accurate forecasting is critical to assuring the right quantity and mix of medical and evacuation assets are deployed with the force.

Other articles highlighted in this issue include:

- *Malaria Surveillance in Operation New Horizon-Peru.* Outlines the Southern Command's efforts to identify and control endemic malaria in the Amazon basin of Peru.

- *The Evolution of Misbehavior in Insurance and Worker's Compensation.* Provides an insightful historical review of insurance fraud. Given the multi-billion dollar costs associated with fraud, all managers and administrators need to maintain awareness of the issue.

- *Acute Myocardial Infarction.* A concise and easy-to-read synopsis of a very important disease. Coronary artery disease and myocardial infarction (heart attacks) remain a leading cause of mortality and morbidity in soldiers and civilians alike.

- *Restructuring the Medical Service Corps: The 70Z Proposal.* Outlines a proposal to consolidate several Medical Service Corps areas of concentration into one. A smaller, leaner AMEDD needs personnel with maximum skill and flexibility. This proposal addresses some of these issues.

- *Surgical Management of Stillman's Clefts: A Case Report.* Describes the operative management of a unique form of gingival (gum) recession.



Major General James B. Peake

Disease and Nonbattle Injury Forecasting

LTC Larry C. Lynch†
Mr Charles W. Elliott††
LTC Pat McMurry†††

Introduction

Disease and nonbattle injury (DNBI) historically accounts for a significant amount of casualties in military operations and reliable prediction of DNBI rates remains an important element of force planning. As U.S. Army operations include a greater proportion of missions other than war, the relative significance of DNBI will increase. Reduced DNBI rates experienced in recent operations reflect improvements in preventive measures, strong logistical support, and increased command emphasis toward prevention. Conceivably, the operational and logistical demands of a major regional contingency might produce DNBI casualties more in line with high rates recorded from World War II or the Korean Conflict. The model presented in this article provides a method to estimate DNBI rates across a wide continuum of operational scenarios, from low-risk environments with strong logistical support, to major regional contingencies with sustained operations and strained logistics capabilities.

Methodology

It is assumed that a reasonably fit force deployed from the continental United States (CONUS) will experience illness and injury at a rate directly related to the level of health risk and inversely related to the protective measures practicable. This model adjusts a baseline DNBI probability, representing the initial health of the force to allow for a change in risk related to geographic location. A second adjustment is made to allow for the nature of the operation in relation to the Army's ability to provide medical logistics support. Each of the three components, the baseline rate (BR), the location risk factor (LRF), and the health support infrastructure (HSI) are described individually.

Baseline Rate

The 5-year average rates of disease (0.24 admissions/1,000 troops/day) and nonbattle injury (0.03 admissions/1,000 troops/day) for U.S. Army troops assigned to Europe represent the baseline component of initial health.¹ There are four reasons for the selection of Europe with its baseline rate of 0.27 admissions/1,000 troops/day. First, soldiers assigned to Europe represent a cross section of Army units in support of combat operations, combat, combat support, and combat service support. Second, the population is relatively stable since an individual soldier is normally assigned there for a 3-year tour. Third, the population does not include immunologically naive recruits or significant numbers of nondeployable individuals.² Fourth, the health risk from the European – mainly U.S. military bases in Germany – environment reasonably approximates that of the CONUS.

Location Risk Factor

The LRF represents the potential impact on DNBI rates from a particular geographic location. A group of deployment preventive medicine (PM) experts were asked to complete a survey of 36 countries of interest.^{3,4} Participants were asked to evaluate each country in nine risk categories relative to the CONUS. Table 1 shows the questions asked and the raw data value to be assigned to each answer.

Five assumptions were given to the respondents of the questionnaire and are included by the LRF model. First, soldiers will receive normal vaccinations and chemoprophylaxis. Second, compliance with a chemoprophylaxis regimen, repellents, water purification

	Factor	Question & Score (Compare to CONUS)	
1	Arthropod	What is the potential for arthropod disease?	1 - Lower 2 - The Same 5 - Higher 10 - Much Higher
2	Enteric	What is the potential for enteric disease? (food and water born gastrointestinal disease)	1 - Lower 2 - The Same 5 - Higher 10 - Much Higher
3	Other	What is the potential for other disease? (nonarthropod, nonenteric)	1 - Lower 2 - The Same 5 - Higher 10 - Much Higher
4	Heat	What is the potential for heat injury?	1 - Lower 2 - The Same 5 - Higher 10 - Much Higher
5	Cold	What is the potential for cold injury?	1 - Lower 2 - The Same 5 - Higher 10 - Much Higher
6	Altitude	What is the potential for altitude injury?	1 - Lower 2 - The Same 5 - Higher 10 - Much Higher
7	Pollution	What is the potential for environmental pollution injury? (both naturally occurring and nonmilitary industrial)	1 - Lower 2 - The Same 5 - Higher 10 - Much Higher
8	Injury	What is the potential for physical injury? (due to condition of country's infrastructure and terrain – excluding heat, cold, and altitude)	1 - Lower 2 - The Same 5 - Higher 10 - Much Higher
9	Infrastructure	What is the current state of the country's health infrastructure? (water treatment, waste disposal and sewer systems, etc; no medical treatment facilities)	1 - Better 2 - The Same 5 - Worse 10 - Much Worse

Table 1. Shows the questions asked of a panel of PM experts comparing the risk for each country to CONUS.

methods, heat and cold injury prevention techniques, and other preventive measures will occur at normal levels for U.S. Forces.⁵ Third, U.S. Forces will not be isolated from indigenous peoples. Fourth, food and water will be provided by U.S.-approved sources and consumption of non-U.S.-approved food or water will occasionally occur. Fifth, blood, blood products, vaccines, and medicines will be provided from U.S.-approved sources.

Raw data responses were weighed by an estimate of the historical incidence rate to put the nine factors into relative importance.⁶ The weighing values are shown in Table 2.

The LRF was then calculated by comparing the points for each country to the points given to CONUS. Table 3 shows the final results for the LRF.

Weight	Type of DNBI
0.20	Arthropod-borne disease
0.15	Enteric disease
0.26	Other disease
0.08	Heat injury
0.04	Cold injury
0.01	Altitude injury
0.06	Pollution injury
0.10	Physical injury
0.10	Health Infrastructure

Table 2. Shows the weight given to each of the answers from the survey. The weight adjusts the raw score to account for the varying amount that each type of DNBI historically contributed to illness and injury.

		LRF			LRF
1	Albania	2.43	19	Japan	1.04
2	Algeria	3.01	20	Jordan	2.44
3	Bangladesh	4.27	21	Kuwait	2.24
4	Bosnia	2.23	22	Libya	3.05
5	Burundi	3.97	23	Mexico	3.02
6	Colombia	3.01	24	N Korea	3.07
7	Cuba	2.22	25	Nigeria	3.86
8	Cyprus	1.82	26	Pakistan	3.73
9	Ecuador	2.92	27	Panama	2.72
10	Egypt	3.23	28	Peru	3.14
11	Germany	1.09	29	S Korea	1.82
12	Greece	1.48	30	Saudi Arabia	2.22
13	Grenada	2.02	31	Serbia	2.15
14	Haiti	3.72	32	Somalia	4.06
15	India	4.15	33	Spain	1.57
16	Iran	3.08	34	Turkey	2.15
17	Iraq	3.10	35	United States	1.00
18	Israel	1.55	36	Zaire	4.11

Table 3. Shows the results for the LRF. The U.S. is the standard to which all other countries are compared.

A previous review of actual DNBI hospital admission rates from recent U.S. Army deployments to Somalia, Haiti, and Bosnia led to the conclusion that once a unit was stabilized for approximately 60 days, the soldiers apparently created a "Little America" environment and the DNBI rate fell accordingly.⁷ In each case, DNBI hospital admissions peaked during the initial deployment phase and again each time a major relocation of troops

within the area of operation (AO) occurred. As a result, within 60 days of deployment or relocation of troops, the country location becomes insignificant and the LRF of the model is set to 1.0.

Health Support Infrastructure

The rates of DNBI are influenced by the availability of those systems which influence the health of a population. Soldiers provided with U.S.-approved food and water, readily available clinical care, strong preventive medicine support, stress prevention activities, separation from indigenous peoples (especially under social conditions), and adequate living conditions will experience low DNBI rates. In fact, recent deployments to Somalia, Haiti, and Bosnia show that under conditions of strong HSI, rates of DNBI for deployed forces can actually fall below the BR of 0.27 admissions/1,000 troops/day. The term "Little America" may actually be misleading, since soldiers in garrison conditions are exposed to a greater variety of risks (alcohol, unprotected sex, traffic accidents, etc) than those found in very restricted deployment scenarios. Soldiers left to their own devices (isolated forces, special operations, disruption of logistics capabilities, etc) historically do not exercise preventive measures effectively. This model offers a range of HSI factors to allow planners to flex with changing conditions.

The five variables of HSI, shown in Table 4, were previously developed through examination of historical DNBI rates as compared to the support commonly provided for each echelon of operations.⁸ Planners must accurately describe the population at risk in terms of the support provided, rather than just using the unit of assignment. For example, some scenarios allow Division-level soldiers a much higher level of HSI support than that normally envisioned in a combat division AO. This model requires planners to select an HSI based upon descriptions of a typical level of HSI afforded at each of the echelons described in the following table.

Formulas for Applying Methodology

Predicted DNBI Rate = (BR) x (LRF) x (HSI)
Admissions Per Day = (DNBI Rate) x (Number of Troops/1000).

HSI Factor	Military Operation Intensity (MOI)
2.40	Emergency/Individual-level HSI. The operational or logistical environment requires that soldiers depend on individual PM measures (iodine tablets, repellents, insect nets, and cat-hole latrines). Unit-level environmental or health protective measures are generally unavailable (billets, heating or cooling devices, showers, easy access to medical facilities, and professional PM support). Morale support activities or facilities (frequent mail service, post exchange vans, sports equipment, movies, games, and religious services) are essentially unavailable.
1.70	Unit-level HSI. Due to isolation or other operational and logistical constraints, units rely on individual and unit PM measures alone. Waste disposal may include field expedient devices designed for short-term use (uncovered latrines, garbage pits, hasty trash disposal techniques). Professional PM support for inspection/certification of water and food supplies might be unavailable or sporadic. Protection from insects could be limited to field sanitation team efforts or individual measures. Medical care for routine illness or injury might be limited to company or battalion-level assets. Morale support activities or facilities would be very limited.
1.30	HSI Support Characteristic of Intermediate Staging Areas. More manageable security, and fewer operational and logistics constraints would allow individuals at this level to experience moderate HSI support. This might include: consolidated mess, bottled or packaged water supplies, enhanced medical support, higher frequency of PM support, managed waste control, more protective billeting, and limited arthropod control. Contractor-provided support would be limited by force protection constraints. Individuals might frequently interface with indigenous peoples or allied forces. The U.S. personnel may share billets and food service capabilities with allied forces.
1.00	HSI Characteristic of Well Developed Staging Areas. This level of HSI would closely resemble that described below. The significant difference would stem from more frequent and less strictly controlled contact with host nation food, water, people (especially social contacts), and more unlimited travel in the host nation.
0.75	HSI Described as "Little America." This level of support is expected to produce levels of DNBI below that normally experienced by a composite of garrison and training activities in CONUS. Close surveillance of food and water supplies, waste control efforts, arthropod control, and environmental or industrial hazards by professional PM assets. Contractors may provide direct support for latrines, food service, water production, waste removal, billets construction, climate control, and control of insects or rodents. The use of alcohol would be strictly limited or prohibited. Routine to moderately extensive medical care would be readily available, including consultation capabilities with CONUS facilities. Extensive morale support capabilities might include regular mail service, physical training equipment, hot showers, movies, occasional communications links to family members, PX facilities, regular religious services, social activities, and supervised tours. More substantial billeting would provide significant environmental protection and would not be shared with host nation or allied forces. Travel would be closely controlled and supervised.
	INSTRUCTIONS: From the above descriptions of HSI levels, select the description (and corresponding HSI Factor) which most closely describes the level of support likely during the time of concern and for the specific location of the troop concentration in question. Use the HSI factor selected only for the time period where those conditions are likely to exist and only for the number of individuals expected to experience those conditions. Repeat use of the model to allow tailoring of the estimate for different conditions, locations, and operational environments.

Table 4. Shows the definition of MOI for five levels. The planner needs to review each definition and select the one that closely matches the military unit's situation.

Application

The following are examples of applying the methodology to estimate DNBI daily hospital admission rate.

Example 1 - Your division is alerted to deploy to

South Korea to help stop an invasion by North Korea. You anticipate intense fighting for the period that you want to estimate DNBI hospital admissions. Your division has 15,000 total troops, of which you anticipate 8,000 will be at MOI one and 7,000 will be at MOI two during the relevant time period.

MOI	Time Frame	BR D=0.24 NBI=0.03	LRF South Korea	HSI	DNBI Rate ⁹	Troops	Admissions per Day
1	< 60 days	0.27	1.82	2.40	1.18	8,000	9.4
2	< 60 days	0.27	1.82	1.70	.83	7,000	5.8

$$\text{Predicted DNBI Rate} = (\text{BR}) \times (\text{LRF}) \times (\text{HSI})$$

$$1.18 = (0.27) \times (1.82) \times (2.4)$$

$$\text{Admissions Per Day} = (\text{DNBI Rate}) \times (\text{Number of Troops}/1,000)$$

$$9.4 = (1.18) \times (8,000/1,000)$$

$$\text{Predicted DNBI Rate} = (\text{BR}) \times (\text{LRF}) \times (\text{HSI})$$

$$0.83 = (0.27) \times (1.82) \times (1.7)$$

$$\text{Admissions Per Day} = (\text{DNBI Rate}) \times (\text{Number of Troops}/1,000)$$

$$5.8 = (0.83) \times (7,000/1,000)$$

Example 2 - Your brigade is alerted to deploy to Bosnia to support the current peacekeeping operations. Your deployment is scheduled to last 6 months. During this period your brigade is planning to fall-in on facilities currently used by U.S. Forces. You do not anticipate a major relocation

of your brigade or any combat operations during the 6-month period. Command policy prohibits alcohol consumption and social contact with the indigenous population. All food and water is procured through approved sources and PM personnel are monitoring all food storage and preparation.

Ops Type	Time Frame	BR	LRF Bosnia	HSI	DNBI Rate	Troops	Admissions per Day
5	< 60 days	0.27	2.23	0.75	0.45	3,000	1.4
5	> 60 days	0.27	1.00	0.75	0.20	3,000	0.6

$$\text{Predicted DNBI Rate} = (\text{BR}) \times (\text{LRF}) \times (\text{HSI})$$

$$0.45 = (0.27) \times (2.23) \times (0.75)$$

$$\text{Admissions Per Day} = (\text{DNBI Rate}) \times (\text{Number of Troops}/1,000)$$

$$1.4 = (0.45) \times (3,000/1,000)$$

$$\text{Predicted DNBI Rate} = (\text{BR}) \times (\text{LRF}) \times (\text{HSI})$$

$$0.2 = (0.27) \times (1.00) \times (0.75)$$

$$\text{Admissions Per Day} = (\text{DNBI Rate}) \times (\text{Number of Troops}/1,000)$$

$$0.6 = (0.2) \times (3,000/1,000)$$

Predicted Rates

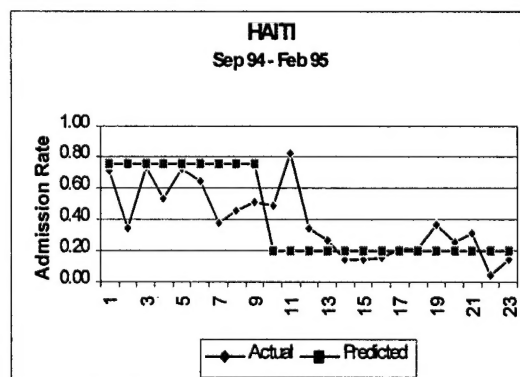
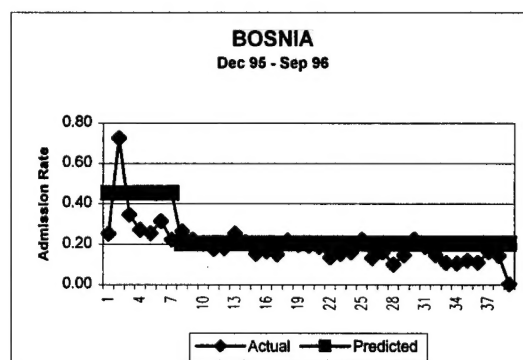
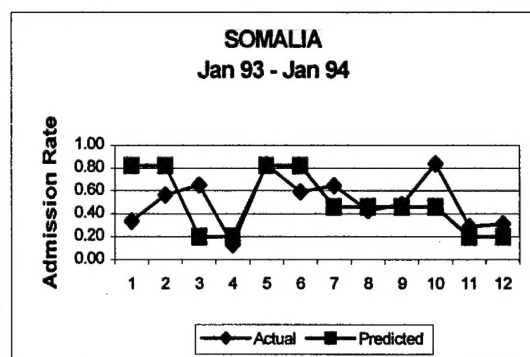
Validation of the Estimate

The final results are shown in Table 5.

		Predicted DNBI Rates				
	MOI >	1	2	3	4	5
1	Albania	1.57	1.11	0.85	0.66	0.49
2	Algeria	1.95	1.38	1.06	0.81	0.61
3	Bangladesh	2.77	1.96	1.50	1.15	0.87
4	Bosnia	1.44	1.02	0.78	0.60	0.45
5	Burundi	2.58	1.82	1.39	1.07	0.80
6	Colombia	1.95	1.38	1.05	0.81	0.61
7	Cuba	1.44	1.02	0.78	0.60	0.45
8	Cyprus	1.18	0.84	0.64	0.49	0.37
9	Ecuador	1.90	1.34	1.03	0.79	0.59
10	Egypt	2.09	1.48	1.13	0.87	0.65
11	Germany	0.71	0.50	0.38	0.29	0.22
12	Greece	0.96	0.68	0.52	0.40	0.30
13	Grenada	1.31	0.93	0.71	0.55	0.41
14	Haiti	2.41	1.71	1.31	1.00	0.75
15	India	2.69	1.90	1.46	1.12	0.84
16	Iran	1.99	1.41	1.08	0.83	0.62
17	Iraq	2.01	1.42	1.09	0.84	0.63
18	Israel	1.00	0.71	0.54	0.42	0.31
19	Japan	0.68	0.48	0.37	0.28	0.21
20	Jordan	1.58	1.12	0.86	0.66	0.49
21	Kuwait	1.45	1.03	0.79	0.60	0.45
22	Libya	1.97	1.40	1.07	0.82	0.62
23	Mexico	1.96	1.39	1.06	0.82	0.61
24	N Korea	1.99	1.41	1.08	0.83	0.62
25	Nigeria	2.50	1.77	1.35	1.04	0.78
26	Pakistan	2.41	1.71	1.31	1.01	0.75
27	Panama	1.76	1.25	0.96	0.73	0.55
28	Peru	2.03	1.44	1.10	0.85	0.63
29	S Korea	1.18	0.83	0.64	0.49	0.37
30	Saudi Arabia	1.44	1.02	0.78	0.60	0.45
31	Serbia	1.39	0.99	0.75	0.58	0.44
32	Somalia	2.63	1.87	1.43	1.10	0.82
33	Spain	1.02	0.72	0.55	0.42	0.32
34	Turkey	1.39	0.99	0.75	0.58	0.44
35	United States	0.65	0.46	0.35	0.27	0.20
36	Zaire	2.66	1.89	1.44	1.11	0.83

Table 5. Shows the predicted DNBI rates by country for each of the five military operation intensities defined in this article. This combines the BR, the LRF, and the HSI into one number that can be applied to the total number of troops in the AO. This determines the average number of hospital admissions that can be anticipated each day. (When the unit is stabilized for over 60 days you should use only the BR and HSI factors, not the full value in this table.)

We tested the validity of our method by comparing predictions to actual rates for Somalia, Bosnia, and Haiti.¹⁰⁻¹² For Somalia, the correlation coefficient between the actual admission rates and the predicted is 0.41. For Bosnia, it is 0.63. For Haiti, it is 0.62. The following graphs show the relationship between actual and predicted rates for each country.



Conclusion

This model provides a tool to predict DNBI admission rates across a wide range of operational contingencies for U.S. Army forces. Raw data for all three of the components used for the methodology (BR, LRF, and HSI) require updating periodically to maintain the accuracy of the model. As automation efforts improve and patient data is more readily captured, the ability of the services to describe the baseline health of the force will improve. Development of new vaccines, repellents, chemoprophylaxis, portable water treatment systems, medical and environmental surveillance techniques, individual protective equipment (respirators, protective clothing, eye protection, etc), and enhanced clinical care will reduce the impact of the risk associated with geographic location. Changes in economic development, civil strife, natural disaster, and a myriad of other changing conditions will require modification of the LRF. Regarding the HSI factor, enhanced logistics support and increasing command emphasis on force medical protection and PM will produce lower rates across the entire range of operational scenarios. Conversely, inclusion of nuclear, biological, and chemical warfare into the range of operational contingencies will require an increase to the upper range of this factor. This model only estimates the admission rate; as surveillance systems become more automated and robust, outpatient data will be available. With the addition of outpatient data, more comprehensive models can be built that will provide valuable planning factors for both the medical and line commanders.

Supplemental Notes

1. Data provided by the U.S. Army Patient Administration Systems and Biostatistical Activity (PASBA), Fort Sam Houston, TX.

2. Continental United States data includes new recruits and nondeployable individuals and therefore could not be used for the BR.

3. We thank the following Medical Corps participants for their hard work: COL Jerome Karwacki, MEDCOM-PM; COL Jose Sanchez, USACHPPM; COL Ernest Takafuji, USAMRMC; COL Mills McNeill, EAMC; COL Dale Carroll, AHS; COL Michael Benenson, AHS; COL Robert DeFraites, USACHPPM; LTC Steven Yevich, USSOCOM; LTC Bonnie Smoak, USAMRU-Kenya; LTC Richard Broadhurst, USASOC. Each has had broad overseas experience.

4. The U.S. Army Concepts Analysis Agency identified the countries to be included.

5. Normal means levels of protection achieved with preventive measures consistent with recent history.

6. An AMEDDC&S, DNBI, Study Advisory Group developed the initial estimate in August 1996.

7. An AMEDDC&S, DNBI, Study Advisory Group conducted this review in August 1996.

8. An AMEDDC&S, DNBI, Study Advisory Group developed these rates in August 1996.

9. The DNBI Rate is the number of calculated hospital admissions per 1,000 troops per day.

10. Data Source for Somalia: Admission Rates from PASBA. Population data interpreted from a CENTCOM chart.

11. Data Source for Bosnia: PASBA.

12. Data Source for Haiti: Task Force Surgeon's Office, Weekly Surveillance Report.

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Army Aeromedical Crash Rates

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Background

Safety is a principal concern for everyone in aviation, including those in military and civilian aeromedical programs. The U.S. Army flies thousands of helicopter (rotary wing) missions each year, including many aeromedical flights. The comparison between Army general and aeromedical aviation crash data provides a benchmark for establishing patterns in aeromedical safety and may be useful for similar programs examining their safety profile.

Introduction

Safety is a principal concern in all aviation programs, including military and civilian aeromedical services. The U.S. Army flies thousands of helicopter (rotary wing) missions each year, including many aeromedical flights. Civilian rotary wing aviation also completes thousands of flights each year, and civilian aeromedical services are similarly active. Comparisons between Army general and aeromedical aviation crash data provides a useful benchmark for establishing patterns in aeromedical safety. Comparing Army safety profiles with published data on civilian services can indicate the relative safety of the programs and may be useful for military and civilian aeromedical programs alike to judge their safety record.

This study will examine the aviation mishap data for Army general and medical rotary wing aviation, with a focus on moderate and serious events. The crash data from

each will be compared and analyzed. The implications for military and civilian aeromedical services will be explored.

Methods

Records from the Army Safety Center, Fort Rucker, AL, and published Army mishap reports from fiscal years 1987 to 1995 were retrospectively reviewed. Aeromedical units are defined as aircraft and crew who are permanently assigned to medical units (for example, Medical Company, Air Ambulance). General aviation units constitute the balance of rotary wing assets. Army mishaps are classified and reported in a standardized fashion in three Classes: A, B, and C. Class A reflects the most serious mishaps and involves loss of life, total permanent disability, or aircraft destruction or damages greater than \$1 million (U.S.). Class B is less serious and involves serious injury, permanent partial disability, or damages between \$200,000 and \$1 million. Class C is less serious still and involves moderate injury, temporary disability, or damage less than \$200,000. Crash rates are compared on a year-by-year basis and are reported as events per 100,000 flight hours. Statistical analysis was performed by the z test with Yates correction, with significance set at $P < 0.05$.

Results

During the study period, 13.13 million total flight hours were recorded, of which 741,000 hours were flown by aeromedical units. The mean Army rotary wing

general aviation Class A crash rate was 1.86 compared with the aeromedical rate of 2.02. The mean Army general aviation Class A to C crash rate was 7.37 compared with the aeromedical rate of 7.41. Between 1992 and 1995, there were 3 years when the Army aeromedical program suffered no Class A mishaps. Figures 1 and 2 graphically depict the Army general and aeromedical rates for the study dates. Differences between the means are statistically significant.

Discussion

In any aviation program, there is an inherent risk of crashes and other mishaps, and Army rotary wing aviation is no exception. The data shows an approximate rate of two serious (Class A) mishaps per 100,000 hours of flight time. Approximately 7.4 serious and moderate (Classes A, B, and C) mishaps per 100,000 hours were recorded. In practical terms, this rate is very low (but certainly greater than zero) and reflects an overall excellent safety record. Differences between Army general and medical operations achieve statistical significance. However, this small difference is interpreted conservatively given the very low rates involved. In other words, the differences in mishap rates for both general and medical operations are largely overshadowed by the very low rates overall. There may be no practical difference between Army general and medical mishap rates.

The small differences that does exist between Army general and medical aviation mishap rates is likely multifactorial. Although pilot selection, cockpit crew size, training, and safety regulations are similar, other factors differ. Medical services fly the Bell "Huey" UH-1 and Sikorsky UH-60 exclusively, whereas general services fly these aircraft in addition to others, including the Boeing CH-47 Chinook and McDonnell-Douglas AH-1 Apache. The different airframes reflect differing missions and operational requirements, and it is logical to expect a significant influence on crash rates. The data does not suggest which factors account for the difference in mishap rates, nor the magnitude of contribution. It is reasonable to conclude, however, that any differences between general and medical aviation are far outweighed by the Army-wide emphasis on safety, given the low rates for both groups.

Class A mishaps appear to be declining in both groups over time (Figure 1). Safety is improving: fewer people are killed and less aircraft are being lost. However, the total number of reported incidents per 100,000 flight hours may not be declining. A review of the data presented in Figure 2 supports this possibility. It would appear that roughly the same number of incidents occur from year to year, but the severity is declining. Further study is needed to evaluate this information.

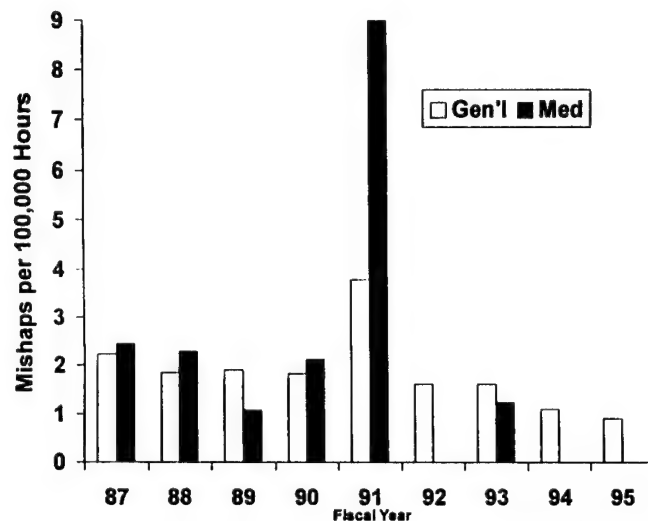


Fig 1. Army aviation Class A mishap rates for fiscal years 1987 to 1995.

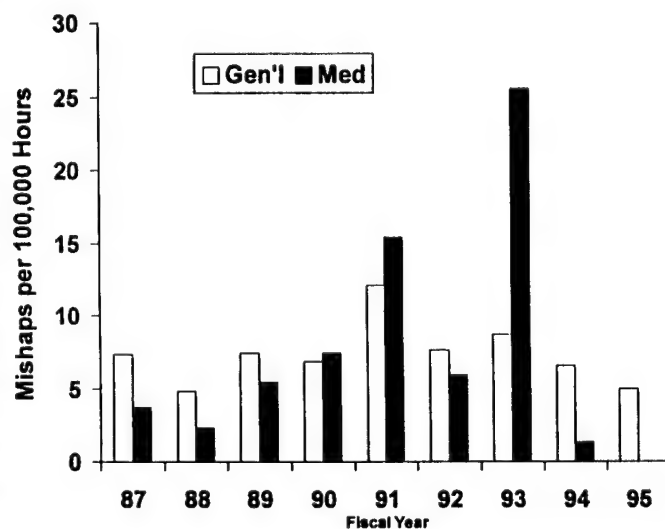


Fig 2. Army aviation Class A to C mishap rates for fiscal years 1987 to 1995.

It is likely the Army's continued emphasis on safety has strongly contributed to the improved records. The

excellent safety profile of Army rotary wing aviation is particularly remarkable given the frequency of worldwide deployments, austere operating environments, and demanding missions. Many operations and training flights occur at low altitude with multi-ship formations in darkness, all with attendant increase risk.

Partial credit for this excellent safety record may belong to the stringent selection and training requirements of Army pilots and to the two-crew configuration of all Army aircraft. Additionally, single-engine aircraft are gradually being replaced by twin-engine models. Data from the civilian sector suggests that the two-pilot, twin-engine configuration is a strong factor in helicopter safety.¹ A minor influence in crash safety is the increasing incorporation of crash-worthiness and survivability into Army airframes. Restraint systems, energy-absorbing seats, fuel fire reduction and suppression, and improved structural integrity can mitigate the effects of a crash.²

The excellent safety record for Army aviation in general continues beyond the study period. Published crash rates for Army general aviation in fiscal years 1996 and 1997 were 0.76 and 1.3 Class A mishaps per 100,000 hours, respectively.^{3,4} This reinforces the trend towards safer flying during the past 10 years. However, not all years have posted enviable records. In 1991, in particular, Army general aviation had mishap rates 3-4 times those of most other years studied. The likely cause of this increase in mishaps was Operation Desert Storm in southwest Asia. Combat losses from enemy action (for example, antiaircraft fire) are not counted as "crashes" by the Army or this study. However, the increased operational tempo during the buildup and ground war is felt to have led to an increase in the number of crashes not directly caused by enemy action. Fortunately, since that time, the rates have declined.

Army safety profiles compare favorably to reported civilian rotary wing crash rates. Civilian general rotary wing crash rates vary between 6 and 8 serious crashes per 100,000 hours, with a recent trend towards fewer crashes.⁵ Civilian aeromedical crashes peaked in 1982, with a rate of nearly 25 crashes per 100,000 hours. Since then, crash rates have declined dramatically to 3 to 5 per 100,000 hours.⁶

The improved civilian aeromedical mishap rates are credited to the increased attention to safety among operators as a result of public criticism. Improved procedures, better pilot screening, and increased pilot staffing were identified as important factors. Additionally, civilian aeromedical services are gradually moving to twin-engine and two-pilot configurations. Another potential factor in the higher civilian mishap rates (compared with the Army rates) is the relatively late appearance of crash-worthiness enhancements in civilian airframes. Furthermore, simple measures in routine Army use, such as flame-resistant flight suits and helmets, are incompletely used by civilian operators. Mayfield surveyed civilian aeromedical crews in 1995 and found that only 73% of respondents regularly wore safety clothing and equipment.⁷

Although comparisons between Army and civilian crash rates are illustrative, caution must be used in interpreting differences. Differences in missions, types of aircraft, and other factors makes direct comparison difficult. Furthermore, crash data are collected and tabulated differently by the Federal Aviation Administration (FAA) and the Army. The FAA data includes crashes involving death, serious injury, or aircraft destruction. Private services, but not all public (for example, municipal, county, or state) services are required to report crashes. In contrast, the Army uses specific criteria to define crash severity and requires reporting from all Army units, active and reserve.⁸ A subtle difference between FAA and Army data collection is the definition of a year. The FAA begins a new year on Jan 1, whereas the Army uses the fiscal year commencing Oct 1.

Despite the limitations of the data, it appears the Army general and aeromedical Class A crash rate compare favorably with published civilian rates. In fact, given the large number of flight hours of Army aeromedical units and the challenging missions they fly, it may be worthwhile to use these Army accident rates as a benchmark for all aeromedical missions, both military and civilian.

The primary limitation of this study is the retrospective nature of the record review. However, the data was used primarily to construct a profile of Army aviation safety, and the effect of retrospective biases is minimal. The data was self-reported by the units involved in the mishaps and

may be subject to reporting biases. The Army, however, has a strict reporting procedure, which makes significant bias effects less likely. The study does not address near-mishaps, minor events, and safety issues not reflected in aircraft crashes. It is possible that potential safety problems exist but are not manifested in Class A, B, or C mishaps. However, because this study examined all significant events that resulted in serious injury, death, or aircraft damage, there is reasonable certainty that consequential data are captured. Although the data gives an accurate picture of safety trends, they do not identify causes or factors involved in mishaps. Further study is warranted to elucidate this information.

This study did not evaluate the safety records of the other branches of service: the Air Force, Navy, Marines, and Coast Guard. Each has a sizable fleet of helicopters, (although smaller than the Army's) and may have different safety profiles. Conclusions regarding the Army experience can only be generalized to the rest of the U.S. military with major limitations. Compilation and analysis of duties from the sister services' data are needed to compare with the Army data.

Conclusion

There is a very low incidence of crashes in both Army general and medical rotary wing aviation programs. There may be no practical difference between the two crash rates. Furthermore, Army crash rates are comparable to published civilian mishap rates.

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Restructuring the Medical Service Corps: The 70Z Proposal

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(Note: The following article presents a proposed realignment of selected Medical Service Corps Areas of Concentration. It does not reflect current AMEDD personnel doctrine and is published as an alternative focus.)

Introduction

The Army Medical Department (AMEDD) continuously strives to develop new and innovative ways to deal with the rapidly changing environment. The AMEDD's vision has shifted to projecting healthy and fit forces, providing combat ready and fully deployable medical forces, while concurrently providing cost-effective quality healthcare for all eligible beneficiaries.

In addition to this vision shift, one of the most profound changes is the adoption of a branch immaterial system for selecting senior leaders to command medical treatment facilities (MTF) and for use in the selection and stationing of AMEDD general officers. Likewise, the Medical Service Corps (MSC) should review how they are adapting to the changing environment and, if necessary, appropriately restructure the areas of concentration to be in concert with these larger on-going changes. The shift of the Army healthcare system toward a more business oriented and readiness focused stance requires officers that are experienced, trained, and well educated in the art of leading both table of organization and equipment (TOE) and table of distribution and allowances (TDA) units. One way that the MSC can lead and achieve this is to combine 70A, 70E, and 70H areas of concentration (AOC) into a single career management field (70Z, Health Systems Officer).

Background

Historically, the MSC senior leaders have explained that MSC officers must be leader developed, experienced, and educated in both TOE and TDA organizations. Adopting the 70Z proposal would create a more highly trained and diversified pool of officers to serve in senior MTF leadership positions.

This new approach allows officers the opportunity to serve in both TOE and TDA leadership positions throughout the duration of their careers. These officers will be educated, trained, and experienced to facilitate a broader understanding of all essential elements of the AMEDD mission. This will provide a cadre of officers better prepared to fulfill the future strategic requirements and roles in the rapidly changing and increasingly complex healthcare environment. This fully supports the Army Surgeon General and his goal of valuing people as the most important resource and greatest source of strength, through the development of AMEDD leaders.¹

Currently, the MSC officers in Healthcare Administration (70A), Patient Administration (70E), and Health Services Plans, Operations, Intelligence, Security and Training (70H), are all managed separately by respective AOC consultants into separate TDA and TOE positions. This provides functional area experts well versed in the

issues within their AOC. While this was effective during the "Cold War" era, it does not facilitate the development of broad-based experiences or provide AMEDD immaterial leader development for these three AOCs. Consequently, the current method of artificially separating healthcare systems officers into TOE (70H) versus TDA (70A) does not meet the requirements for the future AMEDD mission or the vision of our AMEDD senior leadership.

Discussion

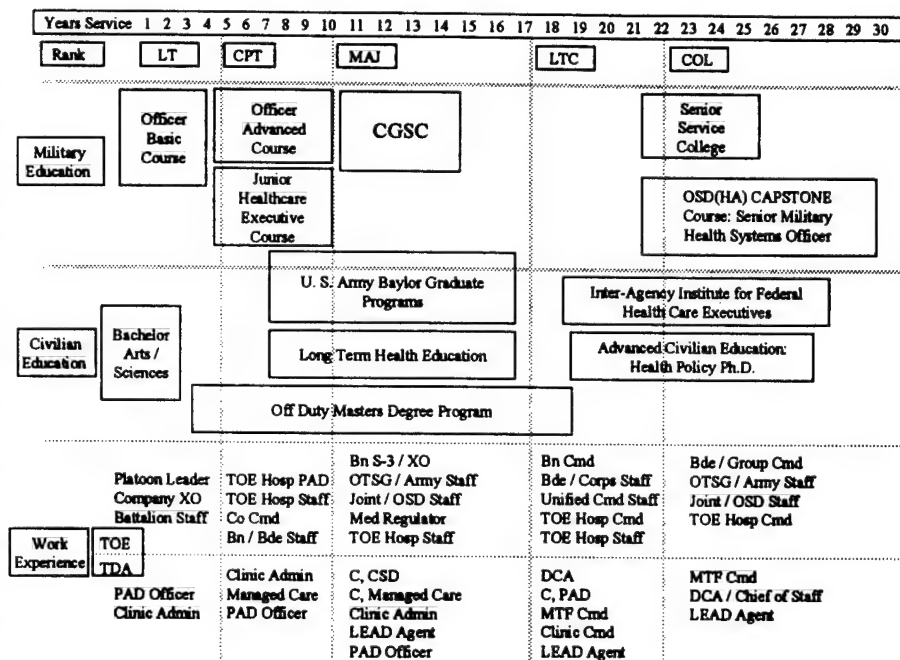
The challenges facing the AMEDD are enormous. The AMEDD mission has shifted and grown increasingly complex with a focus on providing more rapid response with a smaller battlefield footprint. This must be accomplished while the AMEDD concurrently operates in the TOE and TDA environments to provide healthcare during peacetime, contingency operations, and/or full-scale war. As explained on the MEDCOM home page, "the AMEDD is continuously changing to improve efficiency and readiness despite shrinking resources."²

The healthcare field and the U.S. military are changing fast and the AMEDD must also change to reach its vision of "a world-class system for total quality healthcare in support of America's Army at home and abroad, accessible to the total Army family, accountable to the American people."³ In support of this vision, the AMEDD leadership is striving to conduct reengineering to create a modern, unified, and streamlined structure that delegates power and responsibility to leaders who know what needs to be done.⁴ In addition to dealing with these complex roles and missions, the shift to a more business focused stance leaves the AMEDD leadership increasingly accountable for the efficiency and effectiveness of MTFs.

To best meet these challenges and develop leaders "who know what needs to be done," MSC officers of the

future require senior leader mentor-ship, coupled with a mixture of TOE and TDA assignments. These assignments must be blended with appropriate educational and training opportunities. This can provide greater numbers of MSC officers who are better prepared to perform their duties in this rapidly evolving and increasingly complex environment.

The current 70A, 70E, and 70H force structure impedes education and "cross-training" between TDA and TOE positions for MSC officers. As such, the structure must be changed to facilitate the "cross-training" and movement from TOE to TDA positions and back. For example, career development paths could be re-engineered to provide opportunities for the 70Z officer to serve as medical battalion S-2/3 (TOE), clinic administrator (TDA), battalion executive officer (TOE) or chief, patient administration division (TDA). This change would mirror the career path of the medical logisticians' (70K) which have proven successful at leader development through broad-based experiences and senior level mentor-ship. A potential career track is depicted in the table below.



70Z Career Development Matrix

Much like the 70K community, the 70Z will require a defined career path with stated military and civilian educational opportunities. All MSC officers are required to complete military training in the officer basic course, officer advanced course, combined arms services staff

school, and the command and general staff officer course. In addition, the 70Z will require a junior healthcare executive course at the lieutenant or junior captain rank. Next, the most qualified 70Z officers (those who demonstrate proficiency in both TOE and TDA environments) would attend long-term health education and training to obtain an accredited masters degree in healthcare administration or business administration while in the grade of captain or junior major. Concurrently, these officers would obtain some form of civilian credentials from a reputable credentialing organization, such as the American College of Healthcare Executives or the American Medical Administrators of America, among others.

Future Considerations

The current trend at many MTFs is to create a business office to integrate traditionally separate functions such as managed care, marketing, contracting, health benefit advisory, or resource management. Likewise, adopting this 70Z proposal could lead to other beneficial organizational changes. One possibility would be the adoption of a Health Operations office led by a 70Z Health Systems Officer. By converting an existing TDA position to a Health Systems Operations position, the facility could gain significant leadership and management capabilities. This creates several potential benefits. First, the Health Systems Operations officer could perform the day-to-day business operations at the tactical level of the facility, thereby allowing the command element to spend more time on strategic and operational level issues. This would be in concert with new and innovative ways to provide cost-effective and quality healthcare to our beneficiaries. This also mirrors the structure of a classic military organization where all unit activities are coordinated through one operations office (the S-3 or G-3), and one operations officer. Secondly, the operations officer position would serve as a more appropriate training and development ground for future AMEDD leaders in terms of scope of responsibilities and control of resources. Additionally, using a "line" organizational structure will facilitate an increased understanding and compatibility of roles within the Total Army (S1, S2/3, S4, and Comptroller). With slight additional modifications, these 70Z Health Systems Operations officer positions could be coded as branch immaterial. In addition to the varied TOE

and TDA job experiences discussed earlier, the Health Systems Officer would require a masters degree from an accredited university in healthcare or business administration. This would further facilitate the leader development of all AMEDD officers while providing significant progress toward the AMEDD vision of the future.

Recommendation

Combine 70A, 70E, and 70H into one career management field (Health Systems Officer, 70Z). Creating a 70Z career management field will provide the necessary education, development, and experiences to properly leader develop Health Systems Officers for both TDA and TOE responsibilities. This will improve the efficiency and effectiveness of the AMEDD in projecting healthy and fit forces, providing combat ready and fully deployable medical forces, and concurrently providing cost-effective quality healthcare for all eligible beneficiaries.

Conclusion

Adopting these changes will significantly enhance officer professional development and the capabilities of the MSC officer corps. MSC officers must be leader-developed through training, education, job experience, and mentor-ship throughout the TOE and TDA healthcare continuum. This creates a win-win situation for the MSC, the AMEDD, and the Total Army. This will produce leader-developed officers best prepared to lead and support the AMEDD as it enters the 21st century.

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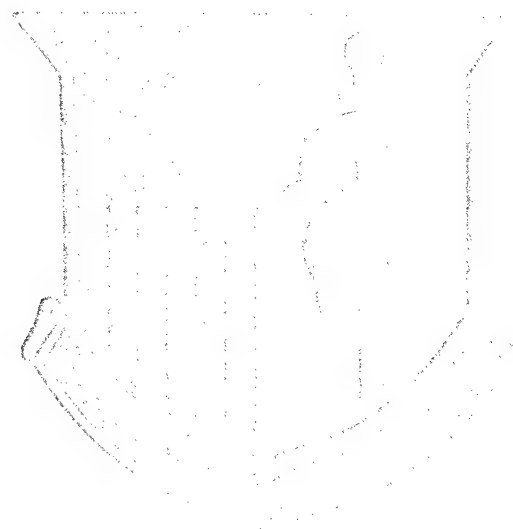
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The Evolution of Misbehavior in Insurance and Worker's Compensation

MAJ M. Nicholas Coppolat

Self-directed patient and employer activities associated with healthcare and insurance fraud produce agency costs every healthcare administrator is struggling to identify and solve in today's competitive and rapidly penetrating managed care market.¹ Illegal claims cost insurance companies and managed care organizations millions of dollars each year.² According to the National Health Care Anti-Fraud Association (NHCAA), healthcare fraud is defined as the intentional deception or misrepresentation that an individual or entity makes when the misrepresentation could result in some unauthorized benefit to the individual, the entity, or to some other third party.³

In 1997, America spent more than one trillion dollars financing healthcare. It is estimated that more than 10% of these dollars are attributable to unethical or illegal behavior.⁴ Of this amount, approximately one-third is directly attributed to claimant fraud, while the remaining two-thirds can be traced to insurance fraud. How did the healthcare and insurance profession end up in such a state? When did the early economic incentives for perpetrating healthcare and insurance fraud for personal or secondary gain from either the claimant or employer/insurance standpoint begin? Historical analysis of some of the earliest cases of fraud reveal where the trend may have began.

The first case of insurance fraud documented in America is medically related and took place in 1819.⁵ A merchant vessel commanded by a Captain Molunder was carrying captive African natives to America to be sold at auction as slaves. During the arduous multi-month trip, the entire crew began to suffer from eye impairments and nutrition deficiencies. Captain Molunder began to wonder if his prisoners might be suffering from the same ailments

and checked his jailed passengers in the lower decks after several months of sailing. He discovered that his prisoners had already become blind and were near death from poor nutrition. Captain Molunder realized he did not have enough rations to feed the crew and captive men, woman, and children to safely sustain the remaining part of the voyage. Faced with the possibility of not having enough rations to feed the crew and captives, Captain Molunder ordered the murder of his hostages and had them thrown overboard. This hideous act increased the remaining rations available for distribution. The crew regained their health and finished the voyage. Upon successful docking in America, Captain Molunder filed an insurance claim for *damaged goods*, stating the slaves had been lost at sea during a storm. The claim was paid after interviewing the entire crew, who sided with the captain's story. It was years later that the diary of Mr Charbonet, a crewmember, was discovered which detailed the horror of the actual event. Despite the hideous loss of human life, the incentive for fraud and murder was a monetary reward!⁶

The earliest case of claimant misbehavior in America may be documented within the U.S. Navy.⁷⁻¹⁰ In 1855, the Navy established the lead in what would inevitably become a successive series of mandates shaping the modern military physical disability system.^{11,12} That same year, the House of Military Affairs established "*An Act to Promote Efficiency in the Navy*." This mandate required that officers no longer capable of performing their duties under field/sea conditions be expeditiously retired. The intent of the mandate was, of course, to "promote efficiency in the Navy." Until this mandate, officers appointed to active duty remained in service until they were cashiered, resigned, or died.¹³ It was only in cases of extreme and unmistakable debilitating conditions that a soldier would be involuntarily separated from

service. The impetus prior to 1855 was on hiding debilitating conditions and keeping the medical record clean to avoid involuntary separation from military service.^{14,15} There simply existed no economic incentive for the soldier-patient to fabricate injuries prior to 1855. On the contrary, it was in the patient's best economic interest to always give the perception of health. Failing to give the perception of fitness might result in the loss of job, pay, and medical benefits simultaneously. Rumors of medical board coercion and manipulation of medical records during the 1855 mandate was prevalent. As a result, the legislation was repealed in 1857.¹⁶⁻¹⁸

In 1861, the economic incentive for a physically impaired soldier to imitate fitness changed when Congress passed "*An Act for the Better Organization of the Military Establishment*."¹⁹ This law provided for the separation/retirement of officers with 40 plus years of service and for the medical separation of soldiers who had incurred injuries while in the line of duty. This Congressional mandate was one of the first of its kind in America to offer a recognized series of workman's compensation benefits to an employee by an employer.²⁰ The industrial workforce soon pursued this trend. In 1920, civilian industry began to offer benefit packages designed to replace declining wages, and in 1942, nonoccupational disability benefits gained acceptance with the introduction of congressionally mandated disability worker plans.²¹ As of 1992, 79% of all employers offer some kind of disability benefit.²² With the change in economical incentive came a change in patient behavior patterns. Rather than a debilitated worker attempting to imitate a fully capable employee, which had been the case in the latter 19th century, it may now be in a perfectly healthy claimant's best economic interest to imitate symptoms of a debilitated person.

This article has detailed some of the earliest documented cases of illegal and unethical behavior regarding insurance and worker's compensation. Unethical and illegal behavior is an issue every healthcare administrator eventually deals with during their career. While the methods of perpetuating this behavior have changed dramatically over the last 100 years, the economic incentives have remained remarkably unchanged. The prudent student of healthcare administration should be

able to recognize trends in unethical or illegal healthcare activity and respond accordingly.

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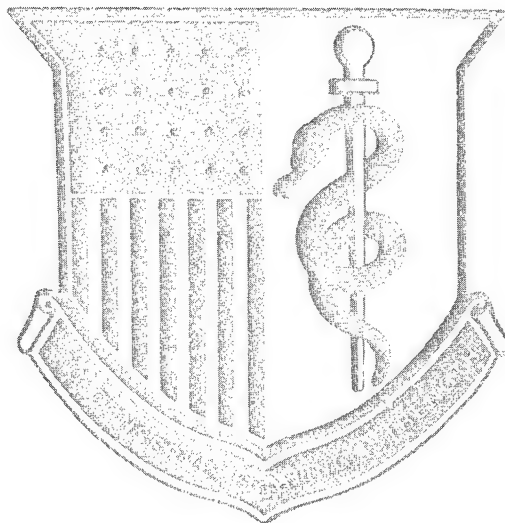
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Malaria Surveillance in Operation New Horizon - Peru

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Two hundred and seventy million people are infected with malaria, and over half the world's population is threatened with this disease. Aside from problems with drug resistance, human population increases and the global climate change has poised malaria to reclaim territory previously lost to control programs, especially in the Americas. This article uses anti-malaria efforts in the Peruvian rainforest as a platform to introduce the first of the New Horizon deployments. In a departure from traditional medical readiness exercises, these deployments incorporated both pre- and post-intervention assessment phases which, hopefully, will help determine the impact of medical and public health interventions on the area's disease.

Malaria in the Amazon Basin

Iquitos is the capital of the Loreto Region located along the Amazon River in the Peruvian rainforest. It has a population of 350,000, and is accessible only by air or boat. Since the beginning of the decade, Loreto has experienced a dramatic increase in malaria, which is believed to be associated with the spread of *Anopheles darlingi*, this area's principle vector.¹ This spread may coincide with the strong correlation between malaria re-emergence and the discontinued practice of spraying dwellings with DDT in 1993.² From 1991 to 1996 cases in the region increased 100-fold, from 850 to 102,000.¹ Furthermore, regional cases of *Plasmodium falciparum* have increased from 140 to 34,000. Throughout the country, the proportion of disease due to *P. falciparum* has increased from 1.6% in 1992 to 28.3% in 1996; the Loreto Region accounts for half of the malaria reported in Peru and 2/3 of all *P. falciparum* cases.³

The United States Agency for International Development (USAID) developed a bilateral agreement with the Government of Peru to implement VIGIA (English translation, "vigilance"), which is a long-term plan designed to address threats of emerging and re-emerging infectious diseases in Peru.¹ Through VIGIA,

USAID and the Peruvian Ministry of Health (MOH) collaborates with the United States Centers for Disease Control and Prevention and Naval Medical Research Institute to address four components believed to improve the capacity to combat these diseases: surveillance, applied research, prevention, and laboratory resources. A priority problem is the re-emergence, diagnosis, treatment, and surveillance of malarial parasites. Through Participating Agency Service Agreements, external expertise is procured to support the effort.

The Department of Defense recognized the problems of emerging infectious diseases as an opportunity to evolve medical readiness exercises. Typical exercises involved treatment, prevention, and education components; however, they lacked an assessment of the efficacy of the operations. Southern Command (SOUTHCOM) proposed the New Horizon concept to the Joint Chiefs of Staff (JCS). The proposal included the traditional objectives of (1) training U.S. medical personnel on geographically restricted disease of military importance; (2) providing the exchange of medical information between countries; and (3) fostering improved relationships between respective countries' military organizations coupled with a new objective: planned assessment of the impact of the public health measures.

New Horizon - Peru

New Horizon - Peru was the first of several scheduled deployments in this new medical readiness exercise format. Pursuant to Presidential Defense Directive 7 (PDD NSTC-7), the JCS approved a SOUTHCOM sponsored joint and combined disease intervention field training exercise. Command intent was to (1) improve joint training readiness of U.S. medical, civil affairs, and engineering units; (2) to exchange skills among the international medical personnel involved; and (3) and to identify and reduce incidence of specific diseases in Peru. Upon approval, SOUTHCOM appointed Southern Air Force as executive agent, who tasked Air Force medical teams to conduct Operation New Horizon - Peru in three phases. All phases would include aggressive case finding, diagnosis, and treatment. In addition, Phase I would involve baseline surveillance (prevalence) of certain diseases, Phase II would focus on interdiction of disease using proven public health interventions, and Phase III would assess the efficacy of operations on the prevalence of diseases relative to the baseline.

Although malaria surveillance is the primary topic of this article, it is important to note that considerable effort was to be dedicated to monitoring other infectious agents such as leptospirosis, typhoid, dengue, and arboviral diseases. Furthermore, medical diagnosis and treatment included diverse specialties such as dentistry, gynecology, and optical fabrication. Participants were tasked from Atlantic Command, Medical Command, Naval Medical Research Institute, Transportation Command, Peru MOH, Peru Defense Forces; Medical Observers were invited from Colombia, Paraguay, Ecuador, Uruguay, Chile, and Argentina.

The initial phase was conducted during Feb-Mar 98 and included survey of 2,249 individuals from four villages (Santo Tomas, Santa Clara, Zungarococha, and Barrios Florido) for specific infectious diseases, including malaria parasites in 1,997 stained blood smears. All villagers were categorized as symptomatic or asymptomatic based on history of fever using interviewers provided by the Peruvian MOH. Laboratory technicians prepared most of the thin and thick blood films from the finger sticks, and set them aside to dry.^{4,5} Laboratory technicians from the

520th Theater Army Medical Laboratory then methanol fixed and stained slides using a rapid Giemsa stain (Figure 1). Some of the parasite detection and identification was performed by American military laboratory personnel; however, most of the slides were read by expert microscopists provided by the Peruvian MOH. Other serologies were performed, but they largely go beyond the scope of this article (preliminary reports have appeared elsewhere).⁶



Fig 1.

Phase II of New Horizon occurred in Jun 98, and focused on public health interventions. This included further case identification and treatment, construction of deep fresh water wells, water and food management, construction of latrines, distribution of mosquito bed netting, vector control, and education.

Lastly, Phase III included a reassessment of disease prevalence (including malaria), diagnosis and treatment, and follow-up work on some of the Phase II activities (some of the wells required repair).

Results and Discussion

Initially, the intervention appeared to be a huge success. Overall, *P. falciparum* and *P. vivax* prevalence were reduced by wide margins: 66.4% and 56.5% respectively (Table 1). In fact, prevalence declined in all villages for both agents (Table 2). Phase II focused on intervention, which included 15,376 patient visits, of which 127 individuals were found to be febrile. Twenty-nine were malaria smear positive (23%), 16 had *P. vivax* (13%), and 13 had *P. falciparum* (10%).

during rainy weather because the mosquito vector proliferates, so the reduction in rates may have been influenced by seasonal variation.

We attempted to normalize our data for this variable with as much historical data as was reasonably available. The Peruvian MOH provided monthly incidence data for 1997 and 1998. We found that the natural malaria cycle was quite impressive; rate reductions comparable to our findings were not unusual simply based on rainy versus dry season (Figure 2).

<i>Plasmodium</i> species	New Horizon – Peru			
	Phase I Cases (prevalence*)		Phase III Cases (prevalence*)	
<i>Plasmodium falciparum</i>	85 / 1,997	(42.6)	35 / 2,450	(14.3)
<i>Plasmodium vivax</i>	71 / 1,997	(35.6)	36 / 2,450	(15.5)
Mixed Infections	1 / 1,997	(00.5)	0 / 2,450	(00.0)
Total	157 / 1,997	(78.6)	71 / 2,450	(30.0)

*Prevalence expressed as cases per 1,000

Table 1. Reduction of Malaria Prevalence Rates between New Horizon Phases I and III, Which Can be Attributed, in Part, to Phase II Intervention

<i>Plasmodium</i> Species	Santo Tomas*		Santa Clara*		Zungarococha*		Barrios Florido*	
	Phase I	Phase III	Phase I	Phase III	Phase I	Phase III	Phase I	Phase III
<i>Falciparum</i>	34.4	9.8	61.7	9.1	59.8	36.3	14.5	2.9
<i>Vivax</i>	39.3	5.9	63.6	19.7	38.6	29.7	3.6	2.9
Mixed	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	76.2	15.7	125.2	28.8	98.5	66.0	18.1	5.8

*Prevalence expressed as cases per 1,000

Table 2. Reduction of Malaria Prevalence Rates Between New Horizon Phases I and III, By Village

While the reductions from Phases I to III were encouraging, constraints based on fiscal year (FY) funding forced all phases to be conducted in the same FY. Ideally, Phase III would have been conducted during the same time of year as Phase I. However, we had to conduct the assessment (Phase III) during the dry season instead of the rainy season, which is when Phase I operations occurred. Malaria increases (both prevalence and incidence)

Two other events further complicated the analysis. The MOH reported an apparent surge in Santa Clara *P. falciparum* cases in early 1997 (data not shown). Secondly, torrential rains occurred in early 1998 (which included Phase I) due to the 1997 to 1998 El Niño/Southern Oscillation (ENSO), which appears to be unfolding as one of the most severe ENSO events in history. Historical studies designed to trend malaria

incidence during El Niño in South American countries during the 20th century have demonstrated a minimal effect in Venezuela to a 17.3% increase in Colombia.^{7,8} Importantly, malaria increased an average of 36.5% in Venezuela and 35.1% in Colombia in the year immediately following El Niño. In fact, the World Health Organization recognizes malaria as the tropical disease most likely to increase as a result of climate change, given population and other human factors.⁹⁻¹¹ Major epidemics of malaria occurred in Peru, Ecuador, and Bolivia following the 1982 to 1983 El Niño.¹²

Venezuelan equine encephalomyelitis virus (VEE) IgG seroprevalence rates increased from 10-15% in three villages (Barrios Florido was excluded) during Phase I to 32-42% in Phase III. Dengue seroprevalence rates also increased from 29-33% to 44-50% during the same time. These observations have some limitations also: the vector would not typically have been *Anopheles* species, the host reservoirs are not as restricted as with malaria, and one can not draw a direct correlation between prevalence rates (active infections) and seroprevalence rates (past infections).

Whereas the timing was a handicap for the

However, we can make some reasonable

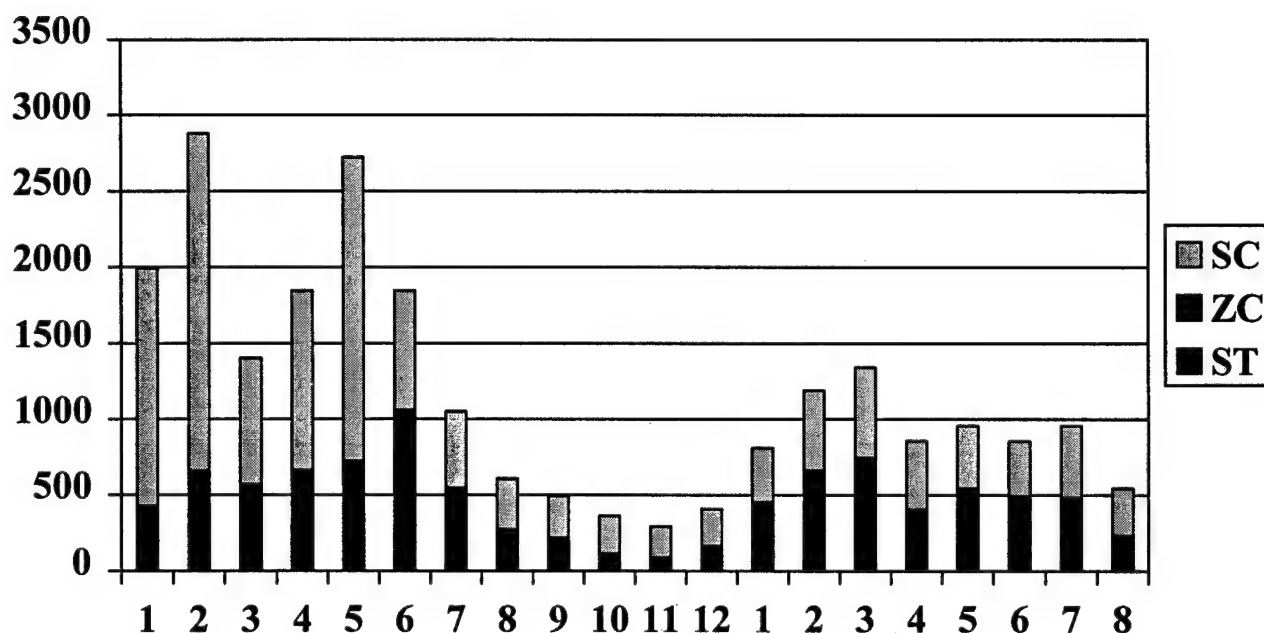


Fig 2. Monthly variation in cases of malaria reported by the Peruvian Ministry of Health from three villages near Iquitos: Santa Clara, Zungarococha, and Santo Tomas.

collection of prevalence data, we might find that a shortened schedule of aggressive case finding and treatment stimulated by New Horizon operations, together with Phase II interventions, may result in avoiding a predictable 30% surge in 1999 disease.^{7,8} Two other sets of New Horizon data (not shown) suggest that this might be the case. While malaria infection rates remained moderate in 1998,

observations. Because seroprevalence tends to be cumulative, it is safe to say that there was high vector activity during the rainy season for two mosquito borne agents, which resulted in a considerable exposure (Santa Clara VEE rates increased 30%, from 10% to 40%). Importantly, these viruses tend to be transmitted by *Aedes* species, which bite during daytime; so the distribution of

bed netting would not have the same impact it would on protecting people from night-biting *Anopheles* species. So, during this period of high vector activity into the dry season, malaria infection rates declined by up to 66.4%. Santa Clara, whose VEE seroprevalence rates increased so dramatically (+30%), also had the largest decline in malaria infection, from 125.2 cases/1000 to 28.8 cases/1000 (-96.4 cases/1000; Table 2). Compared to the other villages, Santa Clara also had the highest incidence of malaria in 1997 (Figure 2). Therefore, it is the authors' opinion that the cumulative effect of the New Horizons active surveillance, diagnosis, treatment, education, and prevention operations improved the short-term outlook for villagers threatened with endemic malaria.

Unfortunately, it is unlikely we will be able to objectively ascertain a long-term, quantitative impact that these operations had on the vicious cycle of malaria in the Peruvian rainforest. However, that should in no way diminish the tremendous impact that these operations had on the health of thousands of Peruvians, the experience gained through cooperative efforts of multinational and interservice teams, and the benefit of real mission training in the diagnosis and management of diseases of global military importance.

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Maximizing Medical Evacuation

LTC Terry Carroll†

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In combat operations, air medical evacuation (MEDEVAC) can be a great combat multiplier. Air MEDEVAC eases the burden on already-scarce evacuation assets and speeds the flow of critically wounded patients to the rear. However, recent experience at the Combat Maneuver Training Center at Hohenfels, Germany, suggests that better coordination and preparation are needed to improve use of air MEDEVAC. In particular, brigades must improve coordination before a deployment among the forward support medical company (FSMC), its forward support MEDEVAC team (FSMT), and the forward support battalion (FSB) staff.

Aeromedical evacuation assets greatly enhance the evacuation capabilities of the FSMC. However, to achieve maximum results, the FSB must provide maintenance, supply, and life support to the FSMT and fully integrate it into logistics operations. While using helicopters improves MEDEVAC capabilities, it also generates new information, training, and safety requirements for the FSB and FSMC. Let me present some ideas on how brigade leaders and planners can integrate the FSMT into brigade logistics operations and improve the team's effectiveness.

Whether a brigade works independently or as part of a deployed division, the bulk of its combat service support (CSS) will be provided by the FSB. The FSB commander and staff and the brigade combat team's S1 and S4 are well versed in ground logistics but rarely are familiar with aviation logistics. The first step for the brigade in using MEDEVAC is to review basic medical operations doctrine and mission training plans (MTPs) for the support of a

brigade, division, and corps. Some basic references include:

- FM 8-10-1, The Medical Company
- FM 8-10-3, Division Medical Operations Center
- FM 8-10-6, Medical Evacuation in a Theater of Operations
- FM 8-55, Planning for Health Service Support
- FM 63-20, Forward Support Battalion
- ARTEP 8-058-30-MTP, MTP for Forward Support Medical Company
- ARTEP 8-44-MTP, MTP for Medical Evacuation Battalion Headquarters

The next step is ensuring that the FSMC support operations section and the brigade S3 (Air) understand the basic tenets of corps-level ground and air MEDEVAC and their specific responsibilities. Brigade planners should request officer and noncommissioned officer (NCO) professional development plans for MEDEVAC operations from the supporting medical evacuation battalion at least 90 days before deployment. In the long-term, MEDEVAC use should be part of the FSB's annual professional development program. Officer and NCO professional development should include the mission essential task lists (METLs) for the FSB, evacuation battalion, and air/ground ambulance companies, including current METL assessments.

Exchanging this information will link the training strategies of the FSB and the evacuation battalion and identify areas that should be emphasized. The units then can develop mutually supporting training objectives and incorporate them into priority training events. This basic understanding of organization, functions, capabilities, and the state of unit training will clarify the expectations of all units.

The FSMT should detail all the support it requires from the FSB. Some examples include:

- Supply - Class III (petroleum, oils, and lubricants), including requirements for aviation-quality fuel and gallons per day; Class IX (repair parts); common Class I (subsistence) and water.

- Maintenance - Support for aviation unit maintenance (AVUM) and aviation intermediate maintenance (AVIM) support, including data on aircraft density and type; automotive maintenance, including vehicle density information; communications and avionics.

- Life support - Billeting; rations.

- Operations - Parachute zone and landing zone organization and operations; weather data access; Army airspace command and control (A²C²) requirements; aircraft security.

- Training - UH-60 Black Hawk helicopter orientation; aviation safety; forward area refueling equipment operations and refueling.

- Health service support planning.

Let's look more closely at some of these areas:

Maintenance

The FSMT normally includes an AVUM capability for conducting preventive maintenance, replacement of components, and limited repairs. The AVIM support requires early coordination among the division materiel management center (DMMC), the aviation support battalion, and corps aviation support units.

In general, the divisional AVIM company or the aviation support battalion can provide maintenance support for the FSMT to augment the medical evacuation battalion's AVIM capability; but these support procedures must be mutually agreed upon before deployment.

Brigade planners should identify all scheduled maintenance and all sets, kits, and outfits needed to perform scheduled maintenance. Scheduled inspections must take place during deployments. Early coordination with the DMMC to throughput aviation repair parts to the FSB will improve repair timeliness.

In short, brigade and unit planners should identify AVIM and aviation Class IX procedures early, coordinate with all associated units and activities before deployment, and establish specific planning milestones to implement aviation-specific support.

Communications

The FSMT deploys with no organic ground communications capability. The FSBs must consider the FSMT's requirements in planning their operational communications nets and ensure that the FSMT has access to and use of AM and FM radios.

Early decisions on radio nets used for MEDEVAC will lessen confusion at every level. Army doctrine does not specify a particular radio net for MEDEVAC; units can use either the brigade administrative-logistics, the FSMC command, or the ambulance platoon net. The brigade must identify one net, publish and disseminate the frequency, and validate the procedure during all CSS synchronization drills and rehearsals. To help everyone know how to contact MEDEVAC, units can attach the nine-line MEDEVAC request format to radios.

The flight operations specialist from the FSMT should be the FSB's link to the FSMT. He should be located in the support operations section. This arrangement facilitates communications and ensures that the FSMT remains in the information loop.

Army Airspace Command and Control

The brigade S3 (Air) and the FSMT must formalize

and rehearse critical A²C² procedures. The support operations section, FSMT flight operations specialist, and brigade S3 staff should work together to ensure that all appropriate flight data arrive at the FSB in a timely manner. Support operations graphics should always include flight hazard and air defense data. The brigade should schedule joint FSMT and FSB flight operations training so FSB personnel become familiar with aviation operations procedures.

Brigade Support Area Defense

The addition of helicopters to the brigade support area (BSA) defense plan creates several challenges. The aircraft have no capability for self-defense and therefore depend on the FSB for security. They also present a significant sight-and-sound signature for an enemy and require an open landing zone near the FSMC in order to transfer patients rapidly. These considerations affect the FSB S3's defense planning and influence how the base cluster is formed. They also complicate decisions about where the FSMC and the FSMT should be located: in the center of the base cluster, as a separate base, or on the BSA perimeter (in accordance with FM 63-20). Air corridors in and out of the BSA also must be planned carefully.

Intelligence

The FSMT needs extensive friendly and threat intelligence data to conduct its operations. The FSB S2/3 should understand the scope and intensity of the FSMT's requirements and should view the FSMT as both a consumer and producer of intelligence data. Aviation-specific intelligence updates, provided on call, should be added to the responsibilities of the S2/3 section. Specific debriefing procedures for MEDEVAC crews also should be developed; flight crews can provide accurate, timely updates to the overall BSA and brigade intelligence-preparation-of-the-battlefield process.

Standing Operating Procedure Exchange

The last step in the initial planning required for a successful deployment is exchange and deconfliction of training and field standing operating procedures (SOPs).

The complete integration of the FSMT into SOPs must precede its operational use, and the FSB must know in detail the costs, in resources and time, of an enhanced evacuation capability.

Preparation and Training

Many required predeployment training events are easily incorporated into unit training plans. Helicopter orientation, litter drills, aviation refueling operations, and related individual and collective tasks should be incorporated into company and battalion training programs; this should be done no later 90 days before deployment.

Specialized training, such as landing zone operations, may require external assistance from the FSMT or the divisional aviation brigade; this support should be requested early. The FSB S3 should maintain oversight of all required predeployment training and provide the FSB commander with weekly updates.

Units should schedule and conduct inventories no later than 60 days before deployment to determine the serviceability of critical support items. These items include the forward area refueling equipment, fuel tankers (which must be certified), landing zone marking kits, and slingloading sets. Conducting inventories well before deployment ensures that there will be sufficient time to reorder, service, or repair equipment as necessary. Units must bring all the documentation required to validate the serviceability of all systems. The FSB S4 should be tasked to maintain visibility of these actions.

The FSMC commander, the support operations officer, and the FSMT leader must jointly develop a methodology for health service support (HSS) planning before deployment. Doctrine on this issue appears contradictory because FMs 63-20 and 8-10-5 name the support operations officer and the FSMC commander, respectively, as the HSS planner. Actually, HSS planning must also include the FSMT leader and the brigade surgeon. The HSS planning may take any form the FSB commander wishes, provided that no aspect of treatment or evacuation is omitted.

The HSS planners should allocate specific

responsibilities to all HSS players. They also should establish a linkup date, time, location, and procedure well before deployment. No later than 7 days before deployment, the brigade should issue the appropriate signal operation instructions to the FSMT and conduct rehearsals of aircraft access and egress into various BSA bases. The FSMT leader and the air defense artillery team leader need to conduct face-to-face coordination to verify identification and operational procedures before deployment. Once deployed, the FSMT becomes a full-time member of the BSA team.

Operational Use of the FSMT

After planning, preparation, and execution of a deployment, the brigade can improve MEDEVAC effectiveness by adopting the following operational procedures:

- Ensure copies of all orders, annexes, and overlays reach the FSMT. The FSMT should participate fully in HSS planning, including mission, threat, and terrain analysis. Require the FSMT leader to produce an air ambulance support annex to the HSS plan.
- Require an FSMT representative to attend all air mission and orders briefs at FSB and brigade. Back-brief air crews on mission requirements. Include the FSMT in the daily BSA tenants meeting.
- The FSMT leader should attend all brigade CSS rehearsals as a full player and present aviation-specific considerations for the mission plan.
- Develop procedures to maintain current A²C², threat, and weather data in the support operations section and maintain liaison with the brigade aviation liaison officer and S3 (Air).
- Formalize the prelaunch air evacuation checklist to facilitate rapid exchange of critical flight data. Develop and rehearse a hasty displacement plan for FSMT aircraft.
- Like all BSA tenants, the FSMT must attend daily intelligence updates (normally provided during tenant meetings) and remain aware of the tactical situation. The

FSB should develop and provide an aviation-specific, short-notice threat briefing update for air crewmen that includes terrain, hazard areas, current activity, and known unit locations.

- Plan for and rehearse contingency operations, such as downed aircraft recovery team operations, search and rescue operations, and reconstitution and reinforcement of medical assets using MEDEVAC aircraft.
- Clarify launch authority for the FSMT. The FSMC commander retains this authority for the brigade area. The FSMC must keep the support operations officer informed of aircraft availability and use.
- Organize and operate the FSMC landing zone with a designated officer and NCO in charge, ground crew, and security element, as required. (See FM 8-10-6, chapter 10, section III.)
- Verify the operability of all air survivability and identification-friend-or-foe equipment before every mission, and conduct a risk assessment.

The use of these operational procedures assumes that the FSMT, FSMC, and FSB are full players in the brigade combat team mission analysis and orders process.

The air ambulance provides the brigade with a capability that can profoundly reduce died-of-wounds rates. But implementing MEDEVAC requires resources, preparation, and cooperation. The brigade must identify and remedy training, material, and procedural shortfalls at home station before deployment. The FSMT assets, coupled with proactive planning and operationally sound use, will provide a significant combat multiplier to the brigade.

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Acute Myocardial Infarction

SGT Timothy Benget

Introduction

Acute myocardial infarction (AMI) is a major cause of morbidity and mortality, and accounts for a substantial proportion of acute hospital admissions. Approximately 900,000 persons in the United States experience AMI, (heart attack), every year; of these, 225,000 die.¹ Of those who die, approximately one-half do so within 1 hour of the onset of symptoms, before reaching a hospital. The majority of early deaths are the results of ventricular arrhythmia's that can be readily aborted by defibrillation.

When a heart attack occurs, it's critical to recognize the signals and respond immediately. About half of all heart attacks victims wait 2 hours or longer before deciding to get help. This reduces their chance of survival, because delay in the early phases increases the risk of sudden death. It also lessens the chance of preserving heart muscle, which raises the risk of disability for those who survive.

Time is essential. The prompt care for heart attack victims dramatically reduces damage to the heart. In fact, 80% of heart attack survivors can return to work within 3 months.² Prompt care for these patients is not the only reason so many people recover so quickly, but it's an important one.

Etiology and Pathogenesis

What is a heart attack (Figure 1)? Heart attacks result from blood vessel disease in the heart, known as coronary artery disease (CAD). The medical term for heart attack is AMI.³ This results when the blood supply to the myocardium is severely reduced or stopped. In greater than 90% of patients with AMI— an acute thrombus, often associated with plaque rupture, occludes the artery, (previously partially obstructed by an atherosclerotic

plaque), that supplies the damaged area (Figure 2).⁴ Altered platelet function induced by endothelial change in the atherosclerotic plaque presumably contributes to the genesis of the clot. Rarely, AMI is caused by arterial embolization. The AMI has been reported in patients with coronary spasm and otherwise normal coronary arteries.

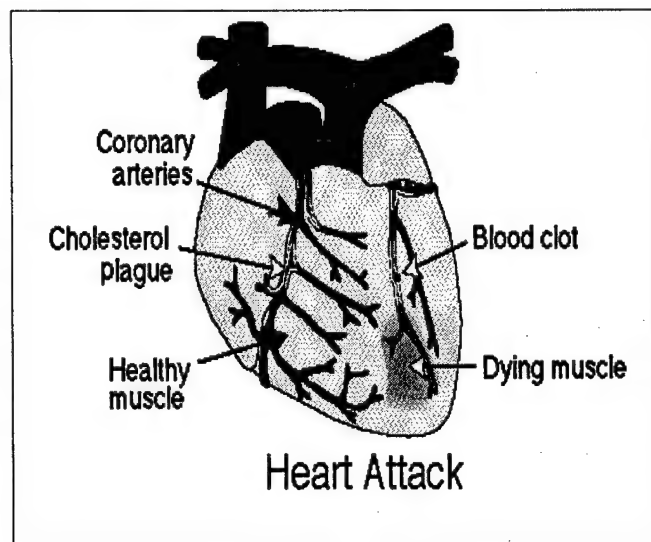


Fig 1. Heart Attack.

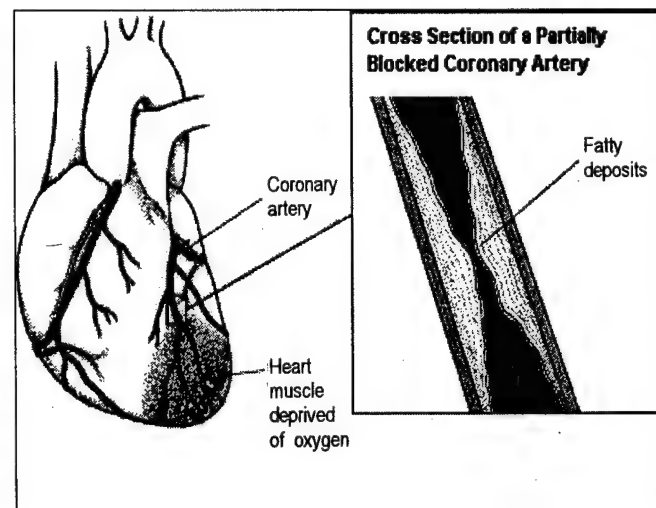


Fig 2. Blocked Coronary Artery.

The AMI is predominantly a disease of the left ventricle, but damage may extend to the right ventricle or the right atria. Right ventricular infarction usually results from occlusion of the right coronary or a dominant left circumflex artery and is characterized by high right ventricular filling pressure, often with severe tricuspid regurgitation and lower cardiac output. Right ventricular infarction should be considered in any patient with inferior-posterior infarction and hypotension or shock and elevated jugular venous pressure.

The ability of the heart to continue to function as pump is related directly to the extent of the myocardial damage (Figures 3 and 4). Anterior infarcts tend to be larger and have a worse prognosis than inferior-posterior infarcts. Anterior infarcts are usually due to occlusion in the left coronary artery, especially the left anterior descending artery.



Fig 3. Normal Myocardium.



Fig 4. Damaged Myocardium.

Risk Factors

The risk of CAD increases with the levels of total cholesterol. Diet, smoking, high triglyceride levels, high blood pressure, obesity, gender, and a genetic predisposition are all risk factors in AMI.

Signs and Symptoms

Some two-thirds of patients experience warning symptoms days to weeks before having AMI.⁵ The symptoms are characterized by angina, shortness of breath, or fatigue. The first symptom of AMI usually is deep substernal, visceral pain described as aching or pressure, often radiating to the back, jaw, or left arm. The pain is similar to angina pectoris but is usually more severe, longer lasting, and relieved little, or temporarily, by rest or nitroglycerin. Discomfort may be mild, and about 20% of AMIs are silent or unrecognized as illness by the patient.⁶ In severe episodes, the patient becomes apprehensive and may develop a sense of impending doom.

Examination of the patient usually will reveal that they are restless, apprehensive, pale, diaphoretic, and in severe pain. Peripheral or central cyanosis may be apparent, and the skin is usually cool. The pulse may be thready and the blood pressure may vary. The patient should be examined in both the supine and left lateral decubitus position. The major findings pertaining to the heart appear on palpation of the precordium in the left lateral position. Many patients initially manifest some degree of hypertension unless cardiogenic shock is developing. Arrhythmia is common: bradycardia or extrasystoles may be observed early in the event; and in those who die, 60% die of ventricular fibrillation before reaching the hospital.⁷ The heart sounds are somewhat distant; the presence of a 4th heart sound is almost universal. The heart rate and rhythm are very important indicators of cardiac function in the initial hours of myocardial infarction (MI). A normal rate usually indicates that the patient is not experiencing significant hemodynamic compromise. Persistent sinus tachycardia beyond the initial 12 to 24 hours is predictive of a very high mortality rate.⁸ The respiratory rate is usually within the normal range.

Diagnosis

The diagnosis of AMI is evident from the history, confirmed by the initial electrocardiogram (ECG) (Figure 5) and its subsequent evolution, and supported by the serial enzyme changes. In some instances, a definitive diagnosis may not be possible, and patients must be classified as having a "possible" or "probable" MI.⁹ The clinical findings are usually typical or strongly suggestive, but confirmation from the ECG and enzyme analysis is lacking.

previous ventricular premature beats). The immediate goal of treatment is to quickly open the blocked arteries and restore blood flow to the heart muscles; a process called "reperfusion."¹² The emergency medical system's early treatment should include: rapid diagnosis, intravenous (IV) fluid administration, oxygen, alleviation of pain and apprehension, stabilization of heart rhythm and blood pressure, administration of a thrombolytic agent when indicated, and transportation to a hospital with the patient attached to a heart monitor. Correctly selecting patients for thrombolytic therapy and avoiding its administering

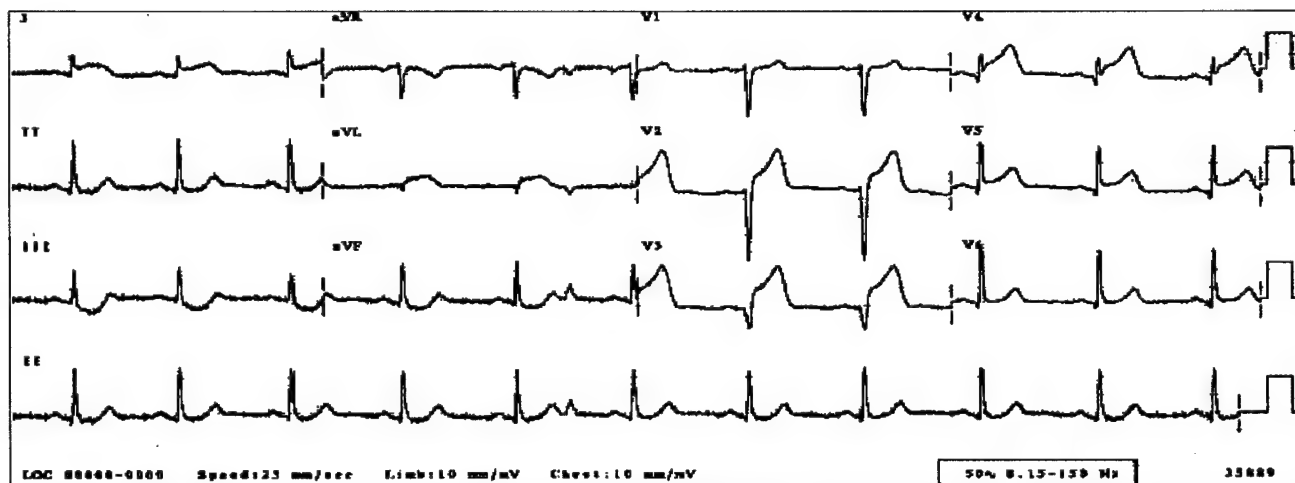


Fig 5. Acute Anterior MI.

It is prudent to consider AMI in all men over age 35 and all women over age 50 when the major complaint is chest pain.¹⁰ It must be differentiated from the pain of pneumonia, pulmonary embolism, pericarditis, rib fracture, esophageal spasm, or chest muscle tenderness after trauma or exertion. Patients often think the pain as indigestion. Acute aortic dissection, renal stone, splenic infraction, and a wide variety of abdominal disorders are other conditions that must be differentiated.

Pre-Hospital Treatment

The first few hours of management of AMI are critical, since 50% of the deaths occur within 3 to 4 hours of the onset of symptoms.¹¹ The patient's state of denial that what they are experiencing are potentially life-threatening illness is a major factor in causing the delay of treatment. The momentous threat to the patient's life is primary ventricular fibrillation (fibrillation without

when not indicated or when contraindicated is difficult and has significant legal, medical, and economic implications. Because of these difficulties, pre-hospital thrombolysis should be emphasized primarily in those circumstances in which it can be administered 60 to 90 minutes before reaching the hospital (because of a long transport time) or when a doctor is in the ambulance.

Treatment in the Hospital

Emergency department AMI protocol dictates that a clinical examination, a chest x-ray, a 12-lead ECG should be done within 10 minutes, and the administration of thrombolytic therapy, if appropriate, within 30 minutes.¹³ The patient should be continuously monitored, on oxygen, and an IV line started, at which time you should draw blood for the lab tests. If the diagnosis is evident and there is no contraindication, an aspirin tablet (325 mg) should be chewed immediately. The alleviation

of pain and anxiety through the administration of IV nitroglycerin or morphine, remains a crucial part in the care of a patient with AMI. Percutaneous Transluminal Coronary Angioplasty used as a primary procedure is an alternative to thrombolytic therapy only if performed in a timely fashion by doctors skilled in the procedure. Remember, the earlier the reperfusion therapy begins, the more favorable the clinical results. The primary therapeutic goals should be to limit myocardial loss and prevent complications or recurrence.

Using echocardiography is useful in evaluating wall motion, presence of ventricular thrombus, ventricular function, and presence of intracavitary thrombus in patients with anterior Q wave infarcts. Transfer to the Cardiac Care Unit should be completed after the patient has been stabilized.

Laboratory Findings

The most important procedure is analysis of the ECG. In acute transmural MI (Q wave infarct) the ECG may be diagnostic, showing abnormal deep Q waves, and elevated ST segments in leads monitoring the damaged area. Nontransmural infarcts (non-Q wave infarcts) are usually in the subendocardial or mid-myocardial layers, are not associated with diagnostic Q waves on the ECG, and commonly produce only varying degrees of ST segment and T wave abnormalities. A diagnosis of AMI is probably unattainable when repeated ECGs are completely normal. However, a normal ECG when the patient is pain free does not rule out unstable angina that may precipitate AMI.

The laboratory findings reveal abnormalities compatible with tissue death. After about 12 hours, the erythrocyte sedimentation rate is increased, the white blood cell (WBC) count is usually elevated, and a differential WBC count shows a shift to the left.¹⁴ The myocardial component of creatine kinase-MB is found in the blood within 6 hours of myocardial necrosis, and elevated levels persist for 36 to 48 hours.¹⁵ The management of complications (severe heart failure, hypoxia, or hypotension) may be enhanced by the measurement of right heart pressures using a Swan-Ganz catheter. Cardiac

output can be determined with the thermodilution technique.

Complications of AMI

Complications of AMI include: sinus node disturbances, life-threatening arrhythmia, persistent sinus tachycardia, ventricular premature beats, cardiac arrest due to ventricular fibrillation, heart failure, hypoxemia, hypotension, cardiogenic shock, recurrent ischemia, functional papillary muscle insufficiency (occurs in about 35% of patients), myocardial rupture, ventricular asynergy, ventricular aneurysm, mural thrombosis, pericarditis, and postmyocardial infarction syndrome (Dressler's syndrome).¹⁶ Continuous monitoring of the patient is vital to diagnosis and to treat these possible complications.

Prognosis and Treatment of Post-Hospital Discharge

The mortality rate in the year after AMI is 8 to 10%.¹⁷ Most of the fatalities occur in the first 3 to 4 months. High-risk patients are associated with continued ventricular arrhythmia, heart failure or poor ventricular function, and recurrent ischemia. Aspirin reduces death and reinfarction rate in patients by 15 to 30%.¹⁸ Enteric-coated aspirin 160 to 325 mg/day is recommended in long-term treatment. Therapy with timolol, propranolol, or metoprolol reduces post-MI death about 25%.¹⁹

The rehabilitation of the patient begins with 2 to 3 days of quiet bed rest, until the course of the illness is evident.²⁰ Physical activity is gradually increased over the next 3 to 6 weeks. Personal ambition, age, extent of the injury, arrhythmia, heart failure, and occupation are factors that influence the rehabilitation program. A regular exercise program that fits with lifestyle, age, and cardiac status may be protective and certainly helpful in maintaining a general well-being. The resumption of sexual activity is encouraged along with other mild physical activities, if the cardiac function is maintained 6 weeks after the MI. Open discussion and a thorough evaluation of the patient's physical and emotional status along with solid advice about smoking, diet, work/play habits, and exercise, together with effective treatment are important obligations of the doctor providing the continual medical care. Doing these may improve the patient's long-term outlook.

Summary

Greater public awareness and lifestyle changes have contributed to a dramatic reduction in the incidence of heart attacks over the last four decades. Testing is being done with direct laser energy and ultrasound waves that attack the blood clot and underlying plaque.²¹ Emergency medical teams, which respond rapidly, and are able to diagnose MIs and provide adequate emergency drugs, as well as performing electrical defibrillation, have been shown in test cities, such as Seattle, to improve and save heart muscle.²² Remember, time is critical.

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Surgical Management of Stillman's Clefts: A Case Report

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LTC Michael F. Cuenin††††

Stillman's clefts are a unique form of gingival recession. They are "apostrophe-shaped" indentations that extend from the free gingival margin into the marginal gingiva. They are usually found on facial surfaces and can be 5-6 mm long. The cause of Stillman's clefts is controversial. Hypotheses range from occlusal traumatism to gingival inflammation. These clefts are rarely reported in the literature and corrective therapy recommendations are virtually nonexistent. This case is believed to be one of the first to report the use of a subepithelial connective tissue graft to surgically manage Stillman's clefts.

Introduction

Tissue dehiscences have been attributed to occlusal trauma, as an extension of periodontal inflammation, toothbrush abrasion, prominent muscle or attachment pulls, factitious stomatitis, and iatrogenic procedures.¹⁻⁶ Stillman's clefts are unique, "apostrophe-shaped" tissue indentations, which extend from the free gingival margin into the marginal gingiva.⁷ They can vary from a slight break in the free gingival margin to a depth of 5-6 mm or more. Stillman's clefts are usually reported to be more prominent on the facial surfaces. The linear margins are generally rolled under, while the gingival margins are often blunted, in contrast to the knife-edged gingival margins seen in periodontal health.

Stillman originally described these clefts in 1921, reporting that they developed perpendicular to the long axis of a tooth.¹ He felt that occlusal trauma was the etiology of this tissue phenomenon. This association has never been substantiated. Klaiber et al reported that there was no conclusive relationship between traumatizing occlusion and 142 Stillman clefts in 37 patients.⁸ Kleber and Blumenthal-Barby found no association between Stillman's clefts and temporomandibular dysfunction syndrome.⁹ Box reported that Stillman's clefts were

pathologic pockets where the ulcerative process extended through the facial surface of the gingiva.¹⁰ Novaes et al reported the formation of gingival and periodontal clefts was related to numerous etiologic and local factors.¹¹ They theorized that inflammation was a constantly occurring etiologic factor, resulting in crevicular ulceration, and subsequent "fistula" or cleft formation. Additionally, the Novaes group cited local anatomic factors, such as tissue thickness, location of osseous support, and root prominence.

Though Stillman's clefts may spontaneously repair, they usually persist when associated with deeper crevices. Tishler reported that local factors are the primary cause of these clefts.¹² He recommends the following treatment options for Stillman's clefts: (1) curettement, which is repeated if necessary and (2) open flap debridement.

Tishler classified Stillman's clefts as simple or complex.¹² Simple clefts, the most common form, demonstrated cleavage in a single direction. Complex clefts have cleavage in more than one direction.

Case Report

A 43-year-old Hispanic male was referred for

periodontal evaluation and treatment. The patient was diagnosed with generalized moderate to severe Adult Periodontitis. Other than smoking one-half to one pack of cigarettes a day, the patient's medical history was noncontributory. After initial therapy, apically positioned flaps with osseous resective surgery addressed all posterior sextants. Of particular interest was the presence of Stillman's clefts, which ranged from 1-4 mm in length at the lingual aspects of teeth No. 22-27 (Figure 1). The area was asymptomatic, but the patient had difficulty with plaque control in the area of the clefts. The patient also presented with significant occlusal wear bilaterally. Examination was negative for any pops, clicks, or crepitus of the temporomandibular joint. The patient was treated with a maxillary splint to curb the suspected bruxism. However, after 9 months, the Stillman's clefts persisted without noticeable change.

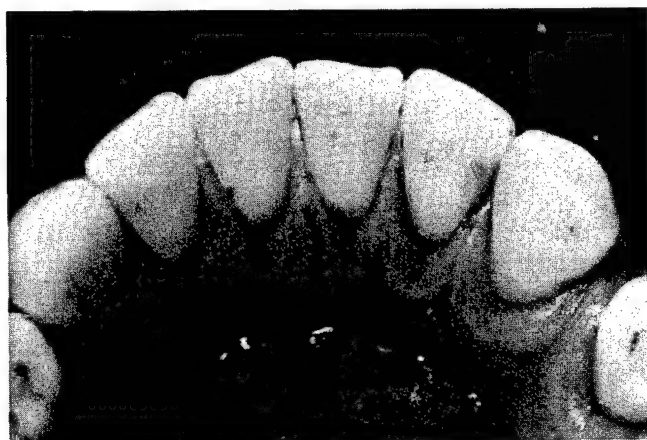


Fig 1. Pre-surgical view of teeth No. 22-27.

A periodontal plastic surgery procedure was chosen to attempt root coverage and eliminate the clefting. The objective of surgical intervention was to create a more physiologic contour. Successful treatment would improve the patient's ability to perform home care at the lingual aspects of his mandibular anterior dentition. A subepithelial connective tissue graft was elected as the treatment of choice.¹³

After a pre-surgical rinse with 0.12% Chlorhexidine, the patient received intravenous conscious sedation (total of 100 mg Fentanyl and 4.0 mg Midazolam). Local anesthesia consisted of 18 mg Bupivacaine, 72 mg Lidocaine, and 0.054 mg epinephrine. Teeth No. 22-27

were scaled and root planed, then etched for 3 minutes with a solution of 50 mg/ml tetracycline. A full-thickness lingual flap with vertical releasing incisions was elevated from the mesial of No. 21 through the mesial of No. 28. A "trap-door" flap was utilized to harvest a 6 mm x 25 mm connective tissue graft from the right palate. The graft was transplanted to the recipient site. The lingual flap was sutured with 6-0 chromic gut from the external surface of the flap, into the connective tissue graft, then secured through the facial papilla. All but one knot was positioned facially (to decrease tongue irritation from the knots and decrease the risk of the patient consciously or subconsciously "playing" with the sutures with his tongue). Good flap closure was obtained (Figure 2). After applying light pressure with a 2 x 2 gauze, hemostasis was achieved and the graft was judged to be stable (as movements of the mouth and tongue did not appear to displace the connective tissue graft). The donor site was closed with 3 interrupted 6-0 chromic gut sutures and a surgical stent covered the palate during the first 7 days of the initial healing. No periodontal dressing or stent was used to cover the grafted site. Post-surgically, the patient received 800 mg Ibuprofen (1 tablet every 8 hours as needed for discomfort), 30 mg Codeine (1-2 tablets every 4-6 hours if severe pain), and 0.12% Chlorhexidine (twice daily for 3 weeks). The patient was instructed to refrain from oral hygiene procedures in the area of surgery for 2 weeks. The patient was advised against biting into anything firm or hard for at least 2 weeks. Additionally, the patient was instructed not to manipulate the area with his tongue for 2 weeks.

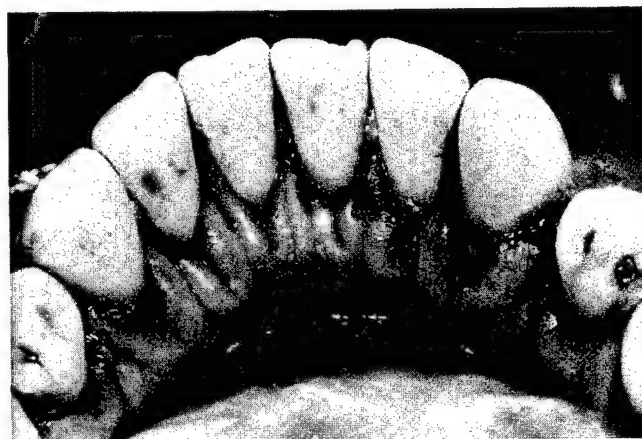


Fig 2. Subepithelial connective tissue graft in place, teeth No. 22-27.

Healing was uneventful. At 1 week post-surgery, the area was deplaqued and sutures removed. The patient had no complaints of discomfort, only a feeling of fullness in the graft area. At the 2-week post-surgery evaluation, healing appeared to be progressing well. Inspection revealed more swelling in the area of No. 22-23, where the thickest aspect of the connective tissue graft had originally been sutured. After cleansing the surgical area, the patient was instructed to initiate normal oral hygiene procedures daily. Healing progressed uneventfully, and at 8 weeks post-surgery, uneven gingival contours were addressed by gingivoplasty. At 12 weeks post-surgery, the area had healed well, in spite of the patients continued smoking and average level of home care (Figure 3). The overall result was deemed successful.



Fig. 3. Twelve week post-surgery.

The patient was placed into supportive periodontal therapy (maintenance) at 3-month intervals. Unfortunately, as this patient transitioned from active duty to retirement, his home care decreased. As an additional compounding factor to healing, his smoking habit increased to approximately 1.5 packs of cigarettes per day. At a 6 month re-evaluation (Figure 4), the tissues were erythematous with pebbly texture. Staining was moderate and the clefting appeared to be returning. Due to change in duty station by the primary author and the patient's retirement, the patient was lost to further care. It is speculated that without the initial connective tissue grafting, the original clefting would have progressed significantly. It is felt that the thick band of keratinized tissue gained by grafting decreased the progression in clefting that was noted at the 6-month re-evaluation.

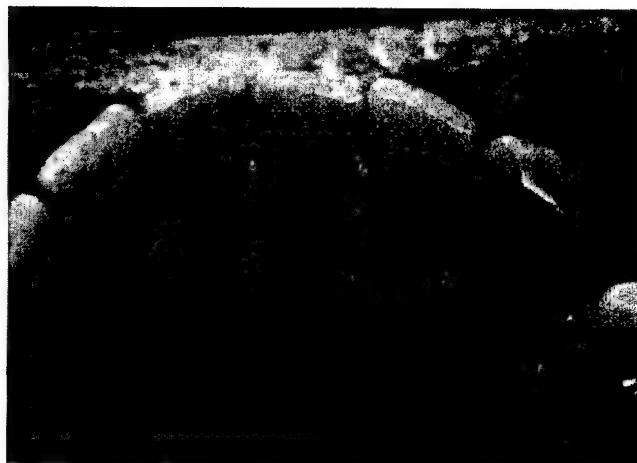


Fig 4. Six month post-surgery.

Discussion

This case presentation describes one possible approach for the treatment of Stillman's clefts. This case was also unusual due to the large number of clefts and their lingual location. Gingival clefts are generally found at fewer sites and on the facial surfaces of teeth.¹

Although occlusal traumatism is a suspected etiology of Stillman's clefts, occlusal therapy (a maxillary splint) did not have any effect on the presence and extent of these clefts, even after 9 months.¹ Our findings were consistent with Klaiber et al, who reported occlusal traumatism was not the etiology of Stillman's clefts.⁸

The procedure utilized was consistent with periodontal plastic surgery, as described by Sullivan and Atkins, Miller, and others.^{14,15} The goal is to provide surgery as atraumatically as possible, both at the recipient and donor sites. In addition, hemostasis, graft coverage with an overlying mucosal flap, and stability of the graft were consistent with the subepithelial connective tissue graft described by Langer and Langer in 1985.¹³

The indications for the connective tissue graft include: (1) inadequate donor site for a horizontal sliding flap; (2) isolated wide gingival recession; (3) multiple root exposures; (4) multiple root exposures in combination with minimal attached gingiva; and (5) where ridge augmentation is desired.¹³ In the present case, the Stillman's clefts resulted in multiple roots being exposed

with minimal attached gingiva. Donn reported that it can take up to 1.5 years before color and form of the connective tissue graft blends into the recipient site.¹⁶ Additionally, he stated that at 4 years post-grafting, the tissue is mature and stable without elastic fibers.

Spontaneous healing of Stillman's clefts (bridging of marginal connective tissue across the cleft), is not expected due to the invagination of the epithelium along the cleft indentation. This epithelium physically impedes fibroblasts from traversing the exposed root surface. Also, with the inability to completely remove plaque, a chronic gingivitis is established. The added burden of plaque further ensures that bridging could not be expected with surgical therapy.

The dental therapy team should be aware of these uncommon gingival clefts. If they impede a patient's oral hygiene efforts, then surgical intervention may be considered. This report is thought to be one of the first to use a connective tissue graft to correct Stillman's clefts of the lingual mandibular anterior sextant.

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Book Review

Black Hawk Down by Mark Bowden. *New York: Atlantic Monthly Press, 1999 (ISBN 0-87113-738-0, \$24.00).*

Reviewed by Dr Wayne R. Austerman, Historian, U.S. Army Medical Department Center and School, Fort Sam Houston, TX.

"Man, God really does love medics." Those were the words spoken by a member of the U.S. Army's elite Delta Force as he watched a medic repeatedly cross and recross a road swept by automatic weapons fire as he retrieved supplies of intravenous fluid bags in order to keep a badly wounded soldier alive in the midst of the disastrous American raid into downtown Mogadishu, Somalia, in Oct 93. The action, which produced two posthumous Medal of Honor winners and a total of 18 dead and 74 wounded American soldiers, has found a masterful chronicler in journalist Mark Bowden. **Black Hawk Down** combines epic narrative storytelling with clear analysis and judicious criticism to make this book the definitive account of a flawed military operation and human tragedy which should rank with the Little Big Horn and LZ X-Ray in the history of American arms. It is also a stirring testimonial to the selfless courage and coolheaded skill of the U.S. Army and U.S. Air Force medics who repeatedly risked their own lives to care for their wounded comrades and keep even the most grievously wounded alive throughout 15 hours of savage close-quarter combat.

The wisdom of American involvement in the anarchic chaos that was Somalia in the early 1990s is still subject to debate, but the officers and men of Delta Force and the 2d Battalion, 75th Rangers, never questioned their mission or hesitated in carrying out their orders under some of the most dangerous and confusing circumstances possible. Ordered to capture two senior associates of Somalia warlord Mohammed Farrah Aidid, 140 of them rappelled from hovering helicopters to assault a building housing their targets in downtown Mogadishu. They captured their quarry but soon became trapped in a maelstrom of fire as tens of thousands of aroused Somali clansmen swarmed into the streets with AK-47s and

rocket-propelled grenades to establish a curtain of fire that sent two UH-60 Blackhawk helicopters down in flames while forcing two others to crash-land. The men on the ground found themselves cut off and isolated, facing odds that made the Alamo look like a fair fight. Trapped in the middle of a sea of enemies, the foot soldiers took immediate casualties in a desperate struggle to stay alive until elements of the 10th Mountain Division mounted in borrowed armored vehicles fought their way through five city blocks of fierce resistance to rescue the beleaguered raiders.

It was truly a situation where "uncommon valor was a common virtue," but every man who rappelled from the Blackhawks that day with Task Force Ranger agreed that the medics set the standard for all in terms of steel-nerved bravery and devotion to the welfare of others. As the fighting raged and friendly casualties mounted, it often seemed that God did indeed favor the medics. The case of Ranger Richard "Doc" Strous was typical. The young medic was tending a wounded man with the help of several comrades when a grenade detonated only a few feet away. The blast ripped Strous from one man's grasp and hurled him aside, but he suffered only minor shrapnel wounds to the leg while the other soldiers were untouched. During the final withdrawal, a bullet hit a flashbang grenade carried on Strous's chest harness, detonating it in an explosion which decked a companion and threw the medic into the air landing in a dazed heap. Scorched and shaken, he was again left unwounded and kept moving unaided.

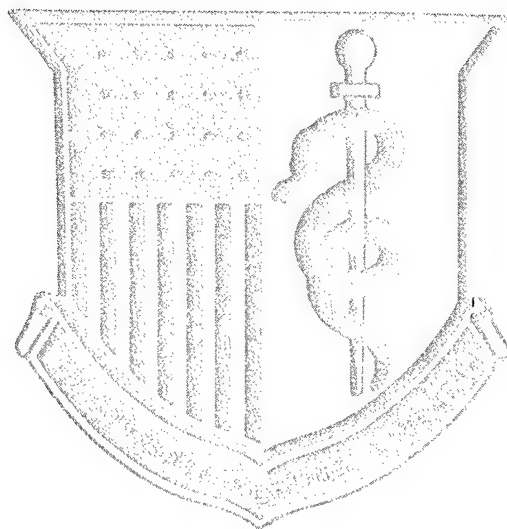
At the Ranger's base camp, a team of surgeons received the few wounded who could be airlifted out during the battle's early stages and then coped with the mass casualty situation which erupted when the 10th

Mountain Division task force returned with the survivors. Delta Force surgeon Major Robert Marsh and Captain Bruce Adams were supported by a nurse anesthetist and two physician assistants, as well as some volunteer nurses from a nearby U.S. Air Force mobile surgical facility. In a scene of carnage which was compared to "some nightmarish medieval painting," the medical professionals triaged the incoming casualties and worked with a frenetic but deft and skilled efficiency which kept many men alive when, by any reasonable expectation, they should have perished hours before from shock, blood loss, and dehydration.

Black Hawk Down is a story of American military medicine at its best at a time when many other elements of the situation went terribly wrong. In reading it, the

reviewer was reminded of the lines of poetry found in the notebook of an anonymous British soldier killed in action during the North African Campaign of World War II: "Help me, oh God, when death is near/To mock the haggard face of fear/That if I fall, if fall I must/My soul may triumph in the dust." Fear was no stranger to any of the medics of Task Force Ranger. Their skill and the courage they shared with all of their comrades living and dead were a triumph for the human spirit in the bleakest of circumstances.

Everyone who cares about the American soldier and the values and skills needed to sustain him in service to the nation, should read **Black Hawk Down**. Anyone who has ever known a medic will feel doubly proud of them after having done so.



AMEDD Dateline

Dr Wayne R. Austerman†

- 1 Jul Seven hundred Union soldiers became drunk on looted medicinal alcohol following the abandonment and retreat from Fort Fillmore, NM, in the face of an attacking force of 350 Confederate troops. Pursued into the desert east of modern-day Las Cruces, the Union troops fell victim to both alcohol abuse and dehydration due to their liquor-filled canteens. The entire command surrendered to the pursuing enemy 2 days after fleeing the post. **(1861)**
- Major James L. Kelly was killed in action while conducting a helicopter casualty medical evacuation mission in the Republic of Viet Nam. His radio call sign of "Dustoff" became the nickname for all such future missions. **(1964)**
- 3 Jul The end of the Battle of Gettysburg left an estimated 51,000 killed, wounded, and missing Union and Confederate troops over 3 days of fighting. **(1863)**
- 8 Jul Colonel Malcolm G. Grow, 8th Air Force Surgeon, received the Legion of Merit for his work in developing body armor for aircrews. **(1943)**
- 9 Jul Gardiner General Hospital in Chicago, IL, was dedicated in honor of 2LT Ruth M. Gardiner, the first Army nurse to die in a theater of operations during World War II. Lieutenant Gardiner died in a plane crash near Nannek, Alaska, on 25 July 1943, while on an air evacuation mission. **(1944)**
- 27 Jul The Continental Congress established a medical service for the revolutionary Army, appointing Dr Benjamin Church of Boston, Massachusetts, as Director General and chief physician. Doctor Church was later exposed as a British spy and removed from his post in disgrace. He died at sea while en route to a foreign exile. **(1775)**
- 1 Aug Secretary of War Jefferson Davis authorized the appointment of enlisted men as hospital stewards with rank equivalent to that of noncommissioned officers. **(1856)**
- 2 Aug Albert Woolson, last survivor of 2.2 million Union Civil War veterans, died in Duluth, MN, at the age of 109. He had enlisted at age 17 in October 1864 in the 1st Minnesota Heavy Artillery. **(1956)**
- 3 Aug Congress authorized The Surgeon General to employ female nurses in U.S. Army hospitals at a salary of \$12.00 per month and one ration per day. **(1861)**
- 4 Aug Public Law 337 established the Medical Service Corps as a component of the Army Medical Department. The new branch absorbed the existing Pharmacy Corps, Sanitary Corps, and Medical Administrative Corps. **(1947)**

- 11 Aug Surgeon James Simons was court-martialed and cashiered for cowardice and dereliction of duty after deserting his post at Fort Riley, KS, when a cholera epidemic erupted. Simons was later reinstated as a surgeon and promoted. Ironically, his essay question for the examining board dealt with epidemic cholera. Early in the Civil War, Simons served as medical director for General U.S. Grant's Army of Tennessee. (1855)
- 16 Aug Major Doris S. Frazier was selected as the first Army Nurse Corps officer to attend the resident course at the Command and General Staff College, Fort Leavenworth, KS. (1967)
- 24 Aug Former Army nurse Clara Louise Maass died of yellow fever following service as a volunteer subject in research conducted at Las Animas Hospital, Havana, Cuba, on modes for transmission of the disease. Doctor William A. Gorgas later stated that her death was a contributing factor in convincing physicians and the public that yellow fever was, in fact, transmitted by a mosquito vector. (1901)
- 30 Aug The Confederate Army of Northern Virginia defeated the Union force in Second Battle of Bull Run, near Manassas, VA. The 2-week delay in clearing the battlefield of all 8,452 Union wounded prompted a Congressional investigation of the Union field medical support system. (1862)
- 31 Aug United States Navy abolished the rum ration. Prior to this date, all seamen received a ration of 1 ½ pints of rum per week. (1862)
- National Naval Medical Center dedicated at Bethesda, MD. By 1945, it had a 2000-bed capacity. (1942)
- 1 Sep Colonel D.E. Carle, Division Surgeon, 2d Infantry Division, assumed operational control of two helicopters for casualty evacuation missions flown from clearing stations to the 8076th MASH at Miryang, Republic of Korea. This marked the beginning of dedicated aerial casualty evacuation operations in the Korean War. (1950)
- 3 Sep Owen T. Edgar, the last surviving veteran of the Mexican War (1846-48), died at the age of 98 in Washington, DC. (1929)
- 4 Sep Medical evacuation pilot Lt Paul Van Boven and medic Corporal John Fuentz landed and rescued a downed U.S. Air Force aviator who had been shot down behind enemy lines in Korea. It was the first such rescue of a downed pilot via helicopter in combat. (1950)
- 14 Sep Public Law 89-609 authorized the grade of Brigadier General for the Chief of the Medical Service Corps. (1966)
- 17 Sep The Union Army of the Potomac and Confederate Army of Northern Virginia clashed on the banks of Antietam Creek, near Sharpsburg, MD, generating what remains the largest mass casualty situation in American history. In 12 hours of battle, nearly 24,000 troops were left dead or wounded. Doctor Jonathan Letterman's recent reforms of the field medical support system permitted the Union forces to cope effectively with the influx of casualties. (1862)

The U.S. Army suffered its first aviation casualty when Lt Thomas Selfridge flew as a passenger aboard a Wright Flyer aircraft. Pilot Orville Wright lost control of the aircraft when a propeller failed in flight, damaging the airframe and causing the machine to plunge 75 feet to the ground at Fort Myer, VA. Lieutenant Selfridge suffered a skull fracture and never regained consciousness. (1908)

- 20 Sep Two days of fighting resulted in the defeat and near-destruction of the Union Army of the Cumberland on the banks of Chickamauga Creek in northern Georgia. The fighting left 1,656 Union dead, 9,756 wounded, and 4,757 missing. Confederate losses totaled 2,132 dead, 14,674 wounded, and 1,648 missing. Both sides lost nearly 28% of their strength and both Union and Confederate medical support systems were strained to the point of collapse. (1863)
- 22 Sep Assistant Surgeon General Samuel Forry submitted his resignation from the AMEDD after "coming under a cloud of suspicion arising from an accusation that he cheated at cards." (1840)
- 30 Sep Public Law 898-609 authorized Regular Army commissions for male members of the Nurse Corps. (1966)

† Dr Austerman is the Historian, U.S. Army Medical Department Center and School, Fort Sam Houston, TX.



Combat Medic Prayer

Oh Lord, I ask for the divine strength to meet the demands of my profession. Help me to be the finest medic, both technically and tactically. If I am called to the battlefield, give me the courage to conserve our fighting forces by providing medical care to all who are in need. If I am called to a mission of peace, give me the strength to lead by caring for those who need my assistance. Finally, Lord, help me to take care of my own spiritual, physical, and emotional needs. Teach me to trust in your presence and never-failing love.

Amen





The AMEDD Regiment

When medical soldiers pin on the AMEDD Regiment Distinctive Unit Insignia, they make certain commitments:

A commitment to maintaining the standards of excellence set in the past

A commitment to fellow soldiers in providing the best medical care

A commitment to the emerging medical technology

A commitment to the unity that exists between the corps and the Army Medical Department specialties

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The AMEDD Journal is published quarterly to provide all members of the Army Medical Department with a medium for the timely dissemination of healthcare, research, personnel, and combat and doctrine development information.

Manuscripts should be submitted with the following guidelines:

- 1. Manuscripts will be reviewed by the Journal staff and, if appropriate, forwarded to the AMEDDC&S activity having subject matter expertise for further assessment.*
- 2. It may be necessary to revise the format of a manuscript in order to conform to established page composition guidelines.*
- 3. Articles should be submitted in disk form (preferably Microsoft Word on 3.5" disk) accompanied by two copies of the manuscript. Journal format requires four double-spaced typewritten pages to complete one page of two-column text. Ideally, manuscripts should be no longer than 20 to 24 pages. Exceptions will be considered on a case-by-case basis.*
- 4. The American Medical Association Manual of Style should be followed in preparation of text and references. Abbreviations should be limited as much as possible. A list identifying abbreviations and acronyms should be included.*
- 5. Photographs submitted with manuscripts can be black and white or color. Color is recommended for best print reproduction quality. Space limitations allow no more than ten photographs per manuscript. Only photographic prints will be accepted for publication. Slides, negatives, or X-ray copies will not be published. Their position within the article should be clearly indicated in the manuscript. To avoid possible confusion, the top of photographs should be marked on the reverse. Photo captions should be taped to the back of photographs or submitted on a separate sheet.*
- 6. A complete list of references used in the text must be provided with the manuscript. This list should include a maximum of 25 individual references. Each should provide the author's last name and initials, title of the article, name of the periodical, volume and page number, year of publication, and address of the publisher.*
- 7. Drugs should be listed by their generic designations. Trade names, enclosed in brackets, can follow.*
- 8. The author's name(s), title, current unit of assignment, PCS date (if applicable), and duty phone number should be included on the title page.*
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